GAS JOURNAL

LIGHT ⁂ HEAT ⁂ POWER ⁂ BYE-PRODUCTS

(Founded in 1849 as the "Journal of Gas Lighting.")

PROPRIETORS: WALTER KING, LIMITED. OFFICE 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

Telephone: Central 6055. —— Telegrams: "GASKING, FLEET, LONDON."

VOL. CLXXVIII., No. 3336.] WEDNESDAY, APRIL 27, 1927. [79TH YEAR.

EDITORIAL NOTES.

Company Promotion and Conduct.

THE gas industry has long been subjected to the attentions of company promoting parasites, who have been living upon its good reputation. In view of this, and the desire of all honest men to keep clean all joint-stock enterprise, there will be satisfaction that—as the result of the work of the Company Law Amendment Committee, of which Mr. Wilfrid Greene, K.C., was Chairman, and Mr. William Cash, F.C.A., was a member—the Bill which the Government recently introduced to amend the Companies' Acts will, *inter alia*, tighten up the law to a degree which will provide substantial obstacles to the public machinations of the pilferers. It will also compel greater recognition of individual responsibility by directors and officers of companies whose operations come under the control of those Acts.

In practically every clause of the Bill, it is seen that at the backs of the minds of the framers is the protection of the public, which is an admission that the existing law has not been wholly successful in this respect. There have been, for instance, ways and means of evading the law in regard to prospectuses, and the practices have become common in recent years. One method has been for shares or debentures to be offered for sale to the public not by the company direct, but by a third party; and this course is adopted to avoid the strict requirements of the law affecting prospectuses. Now it is proposed to secure that, where a company allot or agree to allot shares, in contemplation of an offer to the public, the offer when made shall be deemed to be a prospectus, and all the relevant provisions of statute and common law relating to prospectuses will apply. The morally responsible company will become legally responsible; and the persons making the offer will be subject to the same responsibilities as the company. It is hoped that the public will by the new enactment be no longer deprived of the protection which the Legislature intended they should have in connection with invitations to subscribe for shares or debentures. Furthermore, an invitation to subscribe for shares by the issue of an application form, or in any other manner, will be unlawful unless accompanied by a prospectus which complies with the strict requirements of the principal Act. The fine to be imposed for contravention may be up to £500. It is significant that throughout the Bill the fines proposed are of substantial amount, and in some cases there is the alternative of prison. Well-conducted companies and honest directors, whose directorships are to them trusts, and not a mere tributary for emolument for duties superficially or perfunctorily performed, will approve of this stiffening-up of penalties for contraventions and negligence.

A matter which is of considerable importance in connection with new promotions of a class of which there have been several examples in the gas industry is dealt with in the Bill—whether sufficiently may be a subject for discussion in relation to past experiences. One noticeable feature of a class of prospectus which has been rained upon shareholders in well-established gas companies has been the lack of information regarding the financial history of the concern which is the nucleus of a new company with an astonishingly big name, a big capital, and a landscape before it which is going to yield a golden harvest. The Bill proposes to enact that there shall be published in prospectuses the rates of dividend paid by the company in respect of each class of share in the three financial years immediately preceding the issue of a prospectus, and particulars of any case in which no dividend has been paid in any of those years. And if no accounts have been made up in relation to any part of the three years ending on a date three months before the issue of the prospectus, a statement is to be made of that fact, and whether any interim dividend, and if so at what rate, has been paid during any of the three years immediately preceding the issue of the prospectus. If the proceeds of the issue of shares or debentures, or any part of the proceeds, are or is to be applied in the purchase of any business, there is to be a statement of the amount (as certified by the persons by whom the accounts have been audited) of the net profits of the business in respect of each of the three financial years immediately preceding the issue of the prospectus. Relating to these and cognate provisions, experience shows that care should be taken that cases such as those we have in mind are provided for in new legislation. The machinery of a certain set of company promoters had in it certain superficially independent companies. One of these would buy up a petty undertaking for a small sum. Then, before their ownership had had more than a brief run, the flotation of a new company would be taken in hand by the promoters in question; and the "company" who had purchased the concern, and who had no substantial account period, would become the vendors. In such circumstances, would the clause of the Bill as to a greater revelation of the past financial position of the undertaking be sufficient to protect the public?

The amendment regarding minimum subscriptions will be another bar to the activities of unscrupulous promoters. It is proposed that the minimum subscription on which directors of a new company may proceed to allotment must be sufficient to cover the purchase price of any property, pay the preliminary expenses, and provide working capital. The minimum amount at which allotment will be made must be named in the prospectus, and that sum must be subscribed before proceeding to allotment. To the prescription as to the keeping of proper accounts, there can be no objection, though attached is the salutary penalty for default of imprisonment for a period not exceeding six months, or a fine not exceeding £200. A clause relating to the investigation of the affairs of a company by an inspector of the Board of Trade provides for the punishment of any offender who refuses to produce books or documents desired by the inspector, or declines to answer any question put to him by the inspector. The Board of Trade is to be empowered to refer offences to the Director of Public Prosecutions, who may, if desirable in the public interests, take proceedings.

Dummy and delinquent directors will have cause to reconsider their positions. There are appointed to positions on new companies some men whose titles are simply required for attracting subscriptions of capital; and some of these and other men are appointed to directorships who do not intend to take any responsible share in the management. It is now contemplated to make definite the responsibility of taking office. One of the earlier provisions in the Bill debars companies from giving any financial assistance for the purpose of purchasing shares, unless the ordinary business of the company includes the lending of

money, or unless the money is required by trustees of shares held for the benefit of employees of the company, or as loans to persons in the employ of the company with the view to enable them to purchase shares in it. As to delinquent directors, if, in the event of the winding-up of a company, it appears to the Court that any past or present director, manager, or other officer, or any member of the company, has been guilty of any offence in relation to the company for which he is criminally liable, the Court may direct the liquidator either himself to prosecute the offender or to refer the matter to the Director of Public Prosecutions. After six months from the passing of the Act, any Articles of a company or any contract indemnifying any director, manager, or other officer from liability will become void. There is also to be a larger disclosure to shareholders of the remuneration or other emoluments of directors. Undischarged bankrupts are not to be allowed to obtain soft jobs as directors. The hawking of shares is also to be prohibited.

The Bill contains over a hundred clauses. It may undergo some modifications during its passage through Parliament, but, if so, it is to be hoped they will improve, and not weaken, the intended and desirable protection of the public. It is also time that genuine joint-stock enterprise should be defended from the damaging activities of unscrupulous and fraudulent company promoters.

Tankless Gasholders.

There has lately been such a plethora of material inviting comment that editorial notice has been deferred of the further conference which was held in Germany in January, at the instance of the "M.A.N." and the Gas Engineer of Posen (Herr Thau), to discuss the subject of the safety and working of tankless holders. A translation of a report on the conference prepared by Dr. Karl Bunte appeared in our issue for April 6, and will have been perused by gas engineers who, all over the world, have been following with interest the discussion which has taken place in the "Journal" since news first came to hand from abroad of the disaster to the Posen holder. The "M.A.N." people ought to be deeply grateful to us for raising technical questions relating to the safety and operation of this form of holder in comparison with the types preceding it, and which apparently many engineers agree have relatively such excellent points about them that their construction has not been discontinued. Tankless holders have never been talked about so much as they have been since the Posen mishap was first referred to in these columns; and the ingratitude of the "M.A.N." people has been marked by their silence in reply to our repeated invitations to state definitely and explicitly the improvements that have been effected to cause the new type of holder to be immune (as far as human ingenuity can contrive) from troubles with free space, seal design, sealing liquid, variable strains and stresses, a large diameter moving disc, and so forth. The view has recently been expressed that, as the result of the work of other engineers on the tankless idea, changes of a radical nature may be submitted by them for the consideration of the gas-engineering profession. Since that statement was made, another engineer has mentioned sufficient of what is in his mind as to the form the interior of a tankless holder should take to make us feel that it is not improbable that there may be more than one alternative to the original design with the object of eliminating its critical features. Nothing definite, however, can be said. There's many a slip between a design on paper and material embodiment.

There is no question the tankless holder is the most revolutionary attempt to get away from preceding types that we have yet experienced. It has also given much scope for discussion, although year after year there has been a reticence to impart more for publication than the most general information. Altogether new topic in connection with gasholder operation has been raised; and this appears likely to go on for some time. Although the "M.A.N." have had two conferences since the Posen holder was abruptly thrown out of commission—at which conferences the topics of pumping, tar constitution, escapes of gas, supervision, and inspection have been discussed up and down—we see they have expressed their intention of having further discussions at later dates, which suggests that there are still matters requiring deliberation, and that there is not confidence that bedrock conditions have yet been reached. Everything, of course, is, with time and experience, subject to improvement. However, the second conference did little to settle the points in dispute as to what actually occurred to bring the Posen holder to such grief and untimely inactivity. But the point was made that the considerable improvements effected in the design have enabled a sound engineering job to be made of the holders. Sufficiency of structural strength and positive mechanical movement of the disc are only two points; and even they are subject to time's experiences. But despite rigid specification for the tar-sealing fluid, there are still searchers after a more efficient substitute, which suggests that there is not complete satisfaction with the present prescription. There was discussion as to the utilization of "Imunol" as a sealing and lubricating fluid. The question of its suitability was raised by the "M.A.N." representatives; and reasons were advanced from other quarters which, if sustainable, puts it out of court for the purposes named. It was also learned that the tar-sealing liquid has a propensity for doing things which it ought not to do, or which it is inconvenient it should do. One speaker pointed out that with non-debenzolized gas, the sealing tar takes up light oils in winter, and gives them up to the gas in summer; and in this way adjusts itself immediately to climatic requirements, except in cases of very sudden changes of temperature. To what extent this goes on is not clear; but working close to a declared calorific value in this country, it is hoped that the winter appetite of the seal for light oils from non-debenzolized gas is not of a vigorous or greedy character. It is also noticed that in the case of sudden temperature changes, there is a little time lag between the adjustment of the sealing liquid by robbing the gas or by allowing the gas to rob it. Attention was also called to the fact that the sun shining on one side of a holder would cause expansion of the shell and affect the viscosity of the tar, and so lessen the friction on that side. The "M.A.N." tar investigators are still working on the sealing liquid problem—after upwards of a decade's experience of the operation of these holders. The question of the detection of possible escapes was also considered. But the conference emphasized the fact that these holders require close supervision and care to safeguard their proper working.

We should like to make one correction of a statement in our translation of Dr. Bunte's account of the conference. Through a misinterpretation, this passage appeared in our columns: "They maintained that criticism, where "justified, had been exceedingly sharp, and that reports "of satisfaction with other 'M.A.N.' holders had not "been given, in order to please the makers of other types "of holder." What should have been stated is that the engineers present at the conference made good reports regarding their tankless holder experiences; and they did this, not to please the "M.A.N.," but because they are true.

Inspection in America.

In compliance with the promise made in our editorial columns on March 30, we commence this week a review of the "Instructions" to the staff engaged on free inspection of house piping, meters, and gas-consuming appliances in an American city, in which there are about 485,000 gas consumers. The Company operating in the city in question (the name of which we are asked not to disclose) have had seven years' experience of inspecting consumers' piping, and everything by which gas is used. Some of the details mentioned in the "Instructions" may perhaps be regarded as small; but the long-period experience of the Company, and the magnitude of their operations, assure us that they have found, as all have found in work of this character, that it is the little things that count, make for completeness, and produce satisfaction. It is clear that the Company have no hesitation, or fear of any consequences in respect of liability, in their endeavours to ensure that all is well from the service-pipe to every burner tip, and to remedy anything which is found

wrong in the service. Their one aim is to secure for those who patronize them the utmost efficiency in utilization.

So far as we have gone in our study of the "Instructions," there is only one statement upon which we feel inclined to offer a little criticism. It is this: "The consumer knows when the gas service is satisfactory by "the proper or improper operation of his gas-burning "appliances." In our opinion and experience, a consumer may feel that he has no cause of complaint—his appliances may, to the best of his belief, be all working satisfactorily; but he has not the knowledge which enables him to know whether what is giving him satisfaction represents the maximum ability of the appliances when, in every respect, they and the supply are in good order. It really requires an expert to find out whether an appliance is yielding its maximum efficiency, and therefore service, to the user. Thus we feel that the working condition of an appliance should not be left, as operating at the acme of efficiency, on the mere assertion of the consumer that it is giving him satisfaction. The more important question is, Is it operating to the satisfaction of the Company? If an improvement can be made—say, by adjustment or the remedying of some defect—then the satisfaction of the consumer will be increased; and he will have something for which to thank the Company, and about which to talk among his friends. The inspector who sees and tests for himself, so as to let nothing go back, but ensures that everything is maintained at the highest attainable working level, is doing something which will not only increase the reputation of gas, but will fortify its patronage.

It is manifest that our American friends are taking a great deal of interest in the endeavours which are being made in this country to extend the adoption of the policy of the maintenance of consumers' appliances. An American Gas Engineer has sent us a short communication on the subject, which we also publish this week, and which may be taken to crystallize the views of our American confreres. It is a satisfaction to learn that "the best opinion" in the American gas industry "is a unit in advocating proper maintenance of everything on the consumers' premises." Maintenance is no new thing in the States. There has always been a tendency in this direction. "Request maintenance," with all labour free of charge, is almost an ancient practice; but, as our correspondent says, this has developed in some companies to "periodic maintenance," involving a house-to-house inspection of all gas appliances, generally with no charge for labour, and costing possibly 0·33c. per 1000 c.ft. per annum. This ensures a visit every two or three years to each consumer. In this country, the aim is more frequent inspection than that. But, on the other hand, it is seen that, in addition, special inspections are made, at least once a year, of water heating and house heating apparatus. A wise practice is the complete abandonment of small sizes of services and meters—1¼ and 1½ in. services are now general, and meters of a minimum capacity of 150 to 225 c.ft. per hour are now fairly normal. The aim is to render gas indispensable, and to create a favourable public opinion. We wish that were universal. To take great care of the gas supply up to the meter, and then to neglect it, having regard to the competitive developments of the times, to our mind shows restricted vision and judgment.

Developments in Wales.

An esteemed correspondent has sent us a number of cuttings from the "Western Mail," which are interesting from the point of view that they indicate a trend of affairs intimately concerning the gas indusry. It is obvious that, in some districts more than in others, a new order of things is opening-up for gas undertakings. Evolution is proceeding at increased pace in connection with both concentration of electricity generation and the expansion of the operations and business of bye-product coke-oven plants. In one issue of the "Western Mail," an account is published of the development of the Bargoed Colliery of the Powell Duffryn Steam Coal Company, Ltd.; while in the previous day's issue, a description was given of the large extension which has been made of the South Wales Power Company's great generating station at Pontypridd, which supplies with electricity the whole of Glamorgan and half of the County of Monmouth. Regarding the latter, it is stated that the cost of production of electricity is steadily being reduced; and the price is expected to be further lowered from time to time as the sales increase. That is one source of intensified competition for Welsh gas undertakings. Regarding the development of the Bargoed Colliery, this includes coke-oven and bye-product plants. The descriptive account is interesting; and it shows how in every direction the Powell Duffryn Company are extending their activities through the direct conversion into commercial state of the products from the coke-ovens—this not only in respect of benzole and sulphate of ammonia, but in the preparation of tar for all road purposes, pitch for the manufacture of patent fuel, and in other directions. Market requirements are what weigh in their practices. For example, the Company have secured the sole rights for South Wales and the West of England for the mixing of Trinidad bitumen with refined tar, which compound is sold under the name of "Tarbit." They also go to the length of manufacturing black varnish, which is similar to bitumastic paint, and is an excellent preservative for iron work, wood, tin, &c. Nothing that is produced by the coke-ovens which can be turned to profitable account is lost or sent away for development if it means increased trading latitude for the Company themselves.

We have on occasion urged that a sharp look-out should be maintained by the gas industry for new business openings for the expansion of their processes and products, especially in view of outside developments which may in some way affect the interests of the gas industry. There is the synthetic nitrogen process which has severely repressed the commercial value of bye-product sulphate of ammonia, and which will mean that the gas industry will have seriously to consider the development of their ammonia business in new directions. Referring to this, at the last meeting of the South Metropolitan Gas Company, Dr. Carpenter said: "It is pretty certain that in our "own works, handling over 1¼ million tons of coal per "annum, considerable readjustments of our methods of "working-up ammonia will have ere long to be under-"taken. These, I may say, are subjects of considera-"tion and experiment to-day." Of course, there must be evolution. The gas industry itself contributes to it. It must, however, also readjust itself (as the coke-oven industry is doing), and, if possible, enlarge the borders of its activities in a manner which will fit in with outside advancements which enhance the common economy and efficiency of daily life and industry. Coke-oven gas, at a reasonable price, cannot be allowed to go begging for custom when its best form of utilization is through the gas-distributing mains of gas undertakings. But it must not be forgotten that such utilization is an additional source of strength to the coke-oven industry. It means new revenue for it from a source which it did not possess, or had not developed, at one time of day. In other respects the coke-oven owners are developing their bye-product fields, either directly or through subsidiary companies, wherever an opening can be found. Incidentally, we notice in the "Western Mail" that the Rhymney and Aber Gas Company, who were among the pioneers in utilizing coke-oven gas for town purposes—taking it from the Bargoed Colliery plant—are supplying it, through about 100 miles of mains, to the "teeming population of the Rhymney and adjacent valleys." The price which they are enabled to charge their consumers is, our contemporary states, practically down to pre-war figures; a further reduction having taken place on April 1. Notwithstanding that it is a mining area, the Company have had rapid development in the use of gas for cooking and heating, largely through their own enterprise, but an important factor has been the price at which they have been able to sell the gas. However, to all gas undertakings which carbonize coal, diversity of business within the limits permitted by the secondary products is highly important in helping to maintain a proper balance—as important as is a diversity of gas business in assisting to improve the average level of the draught upon the gas mains.

Southern Working Arrangement.

The scheme for mutual working between the South Metropolitan Gas Company and the South Suburban Company, whereby the resources of the former will be made available to the latter in respect of gas and coal supplies, with capital holding, and representation on the respective Boards, has been approved by the Board of Trade. The scheme was explained at the meetings of the two Companies earlier in the year, when it was ratified by the proprietors.

The Wareham Case.

The recent references in our columns to the petition for the compulsory liquidation of the Wareham Electric Supply Company, Ltd., would not be complete without mentioning that, when the matter came before Mr. Justice Romer in the Companies Winding-up Court on April 5, it appeared that the leader for the Company, Mr. C. A. Bennett, K.C., was unwell and unable to appear. The principal witness, Mr. Eaton, was also unwell, and, it was stated, would not be able to attend for a week or two. His Lordship decided that the petition should stand over until the first petition day after Easter.

British Synthetic Nitrogen.

According to a report in the daily Press, the Billingham plant of Synthetic Ammonia and Nitrates, Ltd., will by 1928 be the second largest in the world, with an output of 315,000 tons of sulphate of ammonia. Relatively this is small in comparison with the German plants, the capacity of which is represented as being many times as great. With the plants in existence, or being erected in other parts of the world, the time must be approaching when there will have to be a limit to the European output. It should be mentioned that, in addition to the 315,000 tons of sulphate of ammonia manufactured at Billingham, about 200,000 tons of other products are made for use in dyeing, refrigerating, baking powder, and other industries.

Wives and the Trade Disputes Bill.

In the industrial areas the women are taking an unexpected interest in the Trade Disputes Bill; and the froth-blowers (who are the extremists) in the trade union world are not pleased that the wives of trade unionists are looking at the matter from a sensible point of view, instead of from the narrow political one of the Socialists, Communists, and those who are humble (or otherwise) disciples of Lenin. There are three things particularly the wives of trade unionists like about the Bill. They are: That mass picketing and intimidation are to be abolished; that men who refuse to take part in an illegal strike will not lose their benefits; and that they are to be relieved from compulsorily paying the political levy.

Coal Output.

The output at the mines during the week ended April 2 amounted to 5,155,600 tons; the wage earners totalling 1,026,200. In the preceding week the output was 5,184,700 tons; the wage earners numbering 1,024,600. In the week ended April 9 the production was 5,294,400 tons; and the number of wage earners 1,028,300.

Common Sense among the Miners.

The expansion of the Miners' Industrial Union in the South Wales area is causing considerable consternation to the Miners' Federation; and probably this inspired an Easter campaign by Mr. A. J. Cook among the men. A week ago the returns showed that sixteen new branches of the Industrial Union have been formed in the district, comprising some 35,000 members, with the head office located at Cardiff, instead of Bargoed. The mine owners are now recognizing the new organization. In Durham and in Notts. and Derby, the new organizations are maintaining their strength against acute opposition by the Miners' Federation.

A National Advantage.

With an increased output of coal at the mines and a somewhat lower number of workers, the economic balance-sheet of the industry is being adjusted. The Secretary of the Mining Association of Great Britain, Mr. W. A. Lee, states: "Whereas twelve months ago the coal industry stood on the brink of the abyss, to-day it is back on the high road to recovery." Taking the rate of coal output at the beginning of 1925—before the grant of the Government subsidy—and comparing it with the present rate of production, Mr. Lee says the figures show a gain of about 40 million tons per annum. Valued at 16s. a ton at the pit, this represents an addition to the national income of £32,000,000 per annum. In 1925 the output was continuously declining; at present it is increasing. The output in March last year was slightly less than it is to-day; but it could only be maintained by the payment of a wages subsidy of £25,000,000 in nine months, or at the rate of £33,000,000 per annum. If we add to the gains those now being enjoyed by industry as the result of the production of coal at a lower price, the advantage to the nation is represented by a considerable figure.

Smoke Abatement in New York.

New York City is moving in the matter of smoke abatement. Dr. Louis I. Harris, the Commissioner of Health for the City, has appointed a Special Advisory Committee to deal with the subject of dense smoke. This Committee, it appears, are going very carefully into the whole subject. Their programme includes the following: (1) An interpretation of the expression "dense smoke;" (2) a discovery of the reasons for dense smoke; (3) possible remedial measures; (4) administrative procedure; and (5) legal action. The Committee feel that the term "dense smoke" should be more specifically defined, with the view of establishing accurate measurements of smoke discharge. It is proposed that all fuels should be divided into two classes—smokeless and non-smokeless—the former consisting of gas, anthracite, coke containing less than 15 p.ct. volatile; the non-smokeless comprising wood, oil, bituminous coal, and coke, and coke briquettes containing over 15 p.ct. volatile. Among other proposals is one that all plants using non-smokeless fuels be required to obtain a licence from the Department after the filing of plans of their equipment, provided the plans show that they would burn such fuel without the discharge of dense smoke; another, that failure to operate these plants properly should result in a revocation of the licence, since a violation would then be due to negligence. Respecting public service plants, it is suggested that they be permitted, where necessity demands, to violate the ordinance within specific limits, and until after a certificate of necessity therefor be issued, which would specify the methods of operation, and the period within which the certificate was valid.

Eastern Counties Association Meeting at Ipswich.

Under the Presidency of Mr. Frank Prentice, Manager and Engineer to the Ipswich Gas Light Company, the half-yearly meeting of the Eastern Counties Gas Managers' Association will be held at Ipswich on Thursday, May 5. Members and guests will meet at the Gas Offices, Carr Street, where they will be entertained at luncheon at 1 o'clock by the Chairman (Mr. Henry Woodall, M.Inst.C.E., J.P.) and Directors of the Ipswich Gas Light Company. The business meeting will take place in the Council Chamber of the Town Hall, by permission of the Mayor (Mr. C. E. Tempest, J.P.), who will officially welcome the members at 2.45 p.m. The main item on the agenda is the President's Address. At the conclusion of the meeting, tea will be served in the library; and at 7.30 there will be the annual dinner of the Association at the Crown and Anchor Hotel. On Friday morning the showrooms of the Company in Carr Street will be available for inspection; and facilities will be provided for those who wish to visit the gas-works. The President will arrange for members who wish to play golf in the afternoon to be conveyed to the links from the gas-works at 12.15.

Testing the Surface of a Road.—In order to investigate the skidding forces on various road surfaces, the National Physical Laboratory have designed a special small-scale apparatus comprising a pneumatically-tyred wheel of 12-in. diameter. Preliminary work with this apparatus has shown that the methods adopted in the design are satisfactory; and a larger apparatus is being considered.

PERSONAL.

Mr. LEWIS E. THOMAS has resigned his position as chemist at the Rhyl Gas-Works.

Mr. W. D. BINGHAM, Deputy Gas and Water Engineer to the Hull Corporation, has been appointed Gas and Water Engineer in succession to Mr. G. B. NEWTON. Since Mr. Newton relinquished the position, Mr. Bingham has been Acting Engineer.

The President of the Board of Education has appointed a Departmental Committee—one of the members of which is Mr. F. W. GOODENOUGH, C.B.E.—to "inquire and report as to the arrangements for the examination of students attending part-time schools (excluding art schools) under the Regulations for Further Education, with particular reference to the place and value of examinations as an element in training for industrial, commercial, and professional activity." This is a matter of interest to the industry, in view of Mr. Goodenough's position as Chairman of the Education Advisory Committee of the Institution of Gas Engineers.

OBITUARY.

ALBERT CLIFF.

It is with much regret that we learn of the death, on April 22, of Alderman Albert Cliff, J.P., Managing Director of Messrs. Williamson, Cliff, Ltd. He was an ex-Mayor of Stamford, and for the twelve months 1922-23 acted as Chairman of Council of the Society of British Gas Industries.

For many years Alderman Cliff had been an associate member of the Eastern Counties Gas Managers' Association; and those who were fortunate enough to take part in the meeting of the Association at Stamford in September, 1925, will still remember the pleasant and informative walk round the town under his guidance. No better guide could they have had; for Alderman Cliff knew all there was to be known about the historical richness of the Royal and Ancient Borough of Stamford, of which he had been three times Mayor. He was a member of the County Council, and was associated with practically all the institutions of the district. The works of his firm, which were visited by the Association during the meeting, were found to be all that a gas retort and firebrick works should be; and during the inspection the members gleaned much practical knowledge of the processes carried on there—knowledge which was added to later in the day, when the visitors were the guests of Alderman Cliff at luncheon. He did good work for the industry as a member over a long period of the Refractory Materials Joint Research Committee of the Institution of Gas Engineers.

The burial was yesterday afternoon, in Stamford Cemetery.

FORTHCOMING ENGAGEMENTS.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

April 30.—WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.—Annual meeting at Newport.
May 4.—MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.—Visit to Donnington Works of C. & W. Walker, Ltd.
May 5.—EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.—Spring meeting at Ipswich.
May 5.—NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.—Annual meeting at Newcastle.
May 6.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Annual business meeting at the Westminster Technical Institute at 7.30.
May 7.—MIDLAND JUNIOR GAS ASSOCIATION.—Visit to the Foleshill Works of the Coventry Gas Department.
May 10.—FEDERATION OF GAS EMPLOYERS.—Meeting.
May 10.—NATIONAL GAS COUNCIL.—Meeting.
May 12.—MIDLAND JUNIOR GAS ASSOCIATION.—Annual meeting.
May 19.—WALES AND MONMOUTHSHIRE DISTRICT INSTITUTION OF GAS ENGINEERS AND MANAGERS.—Meeting at Abergavenny.
May 20.—BRITISH COMMERCIAL GAS ASSOCIATION.—Manchester District Conference at Buxton.
May 20.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—Visit to the Nine Elms Works of the Gas Light and Coke Company.
May 21.—YORKSHIRE JUNIOR GAS ASSOCIATION.—Visit to the Keighley Gas-Works.
May 21.—SCOTTISH JUNIOR GAS ASSOCIATION (EASTERN DISTRICT).—Annual meeting in Edinburgh. Presidential address of Mr. M. Darling, of Cowdenbeath.
May 25.—EVENING STAR LODGE.—Meeting.
May 26.—MIDLAND ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—Spring meeting at Dudley.
May 26.—SOCIETY OF BRITISH GAS INDUSTRIES.—Annual general meeting and dinner, at the Hotel Cecil.
June 11.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Visit to the Margate Works of the Isle of Thanet Gas Light and Coke Company.
July 12.—NATIONAL GAS COUNCIL.—Annual meeting.
Sept. 23.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—Visit to the Torquay Works of the Torquay and Paignton Gas Company.

INSTITUTION OF GAS ENGINEERS.

May 9.—Emergency and Finance Committees.
May 10.—Advisory Committee on Education.
June 13.—Council meeting.
June 14-17.—Annual General Meeting in London.

THE GAS INDUSTRY AND SIR DANIEL GODDARD'S MEMORY.

[Reprinted from the April issue of "The Journal of the Institute of Journalists."]

The beauties of Oak Hill, Ipswich, are known to many men of the gas industry, who, when the Right Hon. Sir Daniel and Lady Ford-Goddard resided there (which they did until Sir Daniel's death) enjoyed their hospitality. It was a pleasure to be with Sir Daniel, who was always buoyant and optimistic, and especially so in his home, in the beautiful setting provided by Nature. Sir Daniel was professionally a gas engineer. His father, Mr. Ebenezer Goddard, in his day was eminent in that profession, and the name of Goddard is highly honoured in the industry. Sir Daniel succeeded his father as Engineer and Manager of the Ipswich Gas Company, and occupied that position for some years. But he was fortunately in a position to indulge his inclination to larger public service; hence his migration from gas engineering to a political life. In the House of Commons he sat as one of the members for Ipswich, but did not lose his interest in the gas industry. He turned to the administrative side, on which his engineering attainments and managerial experience were highly valuable. He was Chairman of some gas companies and a Director of several others.

This association with the gas industry, and the fact that it is Sir Daniel's old home which has been given to the Institute, caused the Editor of the "GAS JOURNAL" (Mr. Arthur F. Bezant, Fellow) to suggest to Sir David Milne-Watson, the Governor of the Gas Light and Coke Company, and the Boards of other Gas Companies with the work of which Sir Daniel had been identified, that it would be appropriate if they would make a contribution to the Oak Hill Endowment Fund.

It is a great gratification that there have been important responses to Mr. Bezant's appeal. From the Gas Light and Coke Company, he has received a contribution of £105 to the Endowment Fund, and from the Ipswich Gas Company £50. The British Commercial Gas Association is an organization in the work of which Sir Daniel was also deeply interested, and a strong supporter. As the result of an appeal to that body, through the Executive Chairman (Mr. F. W. Goodenough, C.B.E.), Mr. Bezant learned from the Secretary that both the Executive and the General Committees, being in complete sympathy with the objects of the Oak Hill Fund, have also resolved to send to it a donation of £105. [The cheque has been received.] Furthermore, the Society of British Gas Industries, through their sympathetic Council, have sent the Editor of the "GAS JOURNAL" a cheque for £25. Thus, from the premier gas undertaking of the United Kingdom, the Ipswich Gas Company, and two of the central organizations of the gas industry, we have, through his effort, a contribution of £285.

On behalf of the members of the Institute, we heartily thank the Gas Companies and organizations for their generous contributions, and Mr. Bezant for his zeal and energy.

We have to acknowledge a further generous contribution to the Endowment Fund. The late Sir Daniel Ford Goddard was Sir Corbet Woodall's successor in the chair of the Tottenham Light, Heat, and Power Company; and the Directors have decided to contribute the sum of 50 guineas.

Psychology of the Gas Industry.—For three years the National Institute of Industrial Psychology have been working in co-operation with a London Gas Company to increase the efficiency of operations on the plant and in the shops. The Institute's third year of work has resulted in notable improvements in the shape and size of several implements used by the men and in the elimination of part of the nervous and mental strain involved in the more arduous forms of work. The system of lighting the retort houses has been improved, so that it now provides more than twice the amount of light previously given, and reduces the amount of shadow to a minimum. A careful study of ventilation has led to substantial reductions in the heat and humidity of the atmosphere, and the Institute's suggested changes in the time at which retorts are "drawn" have been adopted by the Company with excellent results. All these improvements have been welcomed by the workers.

ELECTRICITY SUPPLY MEMORANDA.

THERE is a large field of unprofitable consumption for electricity suppliers which they are longing to occupy. But they are not convinced as to the best course to pursue to convert the unprofitableness into a profit. They can get no farther than the fixed payment principle per lamp, which some engineers assert is good; others that they have tried it, and have failed—the unfettered consumers taking from the cables more than their money's worth. Mr. C. H. Hird, Assoc.M.Inst.E.E., has contributed an article on the subject to the "Electrical Times," from which it may be useful to glean some points, as gas suppliers should be in possession of the main features of this subject. Mr. Hird suggests that the limits to the use of electric light are set first by installation expenses; secondly, by the capital charges on service lines and meters, which are out of proportion to the revenue obtained when the number of units supplied through each service is small. These capital charges, when passed on to the consumer in the form of high rates per unit, meter rents, or minimum quarterly payments, give rise to unfavourable comparisons between the cost of electric lighting and that of other forms of illumination. The annual bill of a consumer taking 80 units at 5d. per unit would be £1 13s. 4d. The expenditure of the undertaking would be approximately:

Unprofitable Consumers.

	£	s.	d.
Cost of generation and distribution, 80 units at 0·75d.	0	5	0
Capital charges on service, 7½ p.c. on £7 10s.	0	11	3
Metering, rendering and collecting accounts	1	2	0
	£1	18	9

Thus, on those conditions, there would be a loss of 5s. 5d. per annum. Mr. Hird says that this is not an extreme or impossible case, as is shown by the following table from the Presidential Address of Mr. W. B. Woodhouse to the Institution of Electrical Engineers in 1924. The data are worth a little study:

—	Percentage of Total Number of Houses.			
No. of Rooms per House	1 to 3.	4 to 5.	6 to 8.	9 or more.
London	18	27·1	42·4	12·5
Manchester	11·8	65·8	20	2·4
West Riding	33·8	48·3	15·5	2·4

The figures indicate what a small proportion of houses, with present installation and service costs, it is worth while electricity suppliers trying, by ordinary methods, to link-up with their cables, unless means can be applied which will place the burden of the whole costs upon the small consumers, and turn them into profit-producing ones. These consumers cannot afford to pay more for one form of light than they can get their needs satisfied for by another form. It is to net the larger of the small consumers—those requiring (say) from four to seven lights—that the assisted wiring scheme has been brought into action. But there are the two or three light householders. Regarding these, Mr. Hird maintains that, if they can be connected, they would provide the best class of lighting load for a power station, because the smaller the number of lamps per installation, the greater the number of burning hours per lamp. He adds that records from a large number of installations of three lamps each show the average burning hours per lamp to be 1650 per annum, corresponding to a load factor of nearly 24 p.ct., assuming the maximum demand is 80 p.ct. of the total connected load.

The Advised Plan.

Mr. Hird's prescription for obtaining this attractive load is to (1) arrange some system of free wiring which will not entail any capital expenditure on the part of the consumer; (2) reduce the cost of services per consumer to something below one-fifth of the present figure; (3) correspondingly reduce the costs of metering, rendering accounts, and collecting. Meters must be abandoned. The cost of current supplied to a small consumer is only about 13 p.ct. of the total expense of giving the supply. He therefore holds that any possible extravagance in which the consumer may indulge, when the restraint of a meter is removed, can be more than saved in reduced capital charges. That is all very well; the fact remains that, if there is extravagance, no matter the cost of the installation, the other consumers pay for it. The meter having been abolished, Mr. Hird submits that there is no need for a separate service for each consumer. One service for a group of five, ten, or even twenty consumers, with distributing mains fixed to the surface of the building, and looped or teed into each consumer's fuse, will make a satisfactory and economical arrangement. The consumer, having no separate meter, is charged a fixed rent for each lamp installed. To avoid rendering accounts, each consumer is provided with a rent card, which is signed by the collector each time payment is made; the rent per lamp being fixed to cover the cost of supply and capital charges on the installation. In the first tabulated statement quoted in the preceding paragraph, it is estimated that the cost of supplying a small consumer, taking 80 units per annum, would be £1 18s. 9d.; but, on the system just described, allowing 50 p.ct. increase in consumption (why there should be this increase is not explained), the cost of supply would be approximately as follows:

	£	s.	d.
120 units at 0·75d.	0	7	6
Capital charges on consumer's installation, proportion of service and distributing main—10 p.ct. on £3	0	6	0
Cost of collecting, &c.	0	10	10
	£1	4	4

Thus there is a saving of 14s. 5d. per annum, without making any allowance for the decreased cost of the extra 50 p.ct. of units supplied under the same maximum demand. This is cutting it all very fine; and it is difficult to see why an electricity undertaking with the lighting load already at the peak of the day's demand, would find its business improved by adopting a speculative class of business of this kind. Concluding his article, Mr. Hird gives information regarding the experiences with the fixed light system in Gillingham, as carried out for the undertaking by the Fixed Price Light Company, Ltd. Reference to these experiences appear in the "Memoranda" for Feb. 16, p. 373.

Cost of Cooking.

In an editorial article in the "GAS SALESMAN" this week, the question of comparative costs with gas and electricity is touched upon; and in it is seen how completely gas can beat electricity in both heating and cooking operations. It seems to us that some of the writers in our electrical contemporaries regard their readers as being absolutely devoid of intelligence. "Hotspot" in the "Electrical Times" for April 14—referring again to the four years' electric cookery experiments of the London County Council Education Committee at four different cookery centres with four different staffs—states that it was discovered that there was equality of cost and efficiency between gas and electricity, with electricity at 1d. per unit. Now we submit to "Hotspot" that he would not dare to engage in comparative experiments with a modern gas cooker and a modern electric cooker at 1d. per unit (including the use of the hotplate), and commit himself beforehand to the statement that, for equal work, there would be equality of cost and efficiency. If he accepts the "equality of cost and efficiency" statement, then he admits that the Education Committee of the London County Council know more about this matter than he does himself. He also refers to the fact that, on the Eltham Housing Estate, the Woolwich Borough Council Electricity Department have altered their tariff to a two-part one, in which ½d. per unit is the running charge instead of 1d.; and he says they have halved the cost of cooking electrically in that area. Is that true? The cost of the units consumed at ½d. per unit must be added to the primary charge, and the average worked out to get the correct figure paid per unit. His further comment is: "In these circumstances, the equality balance as established by the London County Council Education Committee between the cost of cooking electrically and by gas gets badly tilted. Cooking by gas obviously costs twice as much as cooking by electricity." Will "Hotspot" care to engage in a demonstration to prove this "obvious" assertion? It is one thing to talk airily, and another to prove by action. We give electrical men credit for not being all fools.

Gas v. Electric Furnaces.

Turning to industrial matters, references are invited to the utilization of gas and electricity for furnace purposes. Our electrical contemporaries are not so emphatic as they were at one time regarding the superiority of electric furnaces over the modern types of gas furnaces. "Hotspot," for instance, in the "Electrical Times" for March 31, magnanimously asserts that gas-heated furnaces "are fairly extensively used, and as an alternative to the electrical type where electricity supply is not available, or where rates are uneconomically high, they represent probably the best substitute." Thanks! We suggest to him that from the foregoing the "fairly" might well be omitted, and all the words after "used" should be deleted, in view of the fact that the use of gas furnaces swamps that of electrical furnaces, and the arbiters are the industrialists of the country, and not "Hotspot." It appears that he has been furnished with information regarding the economic advantages of one of (so he asserts) the "most modern types" of gas-heated furnaces. The furnace is of the regenerative type. He then proceeds to give data for two cases which he says indicate the best that modern gas-furnace practice can do in respect of annealing or normalizing grey iron castings of light section. We need not refer to both

cases, but will take the second example—normalizing steel castings at a temperature of 960° C.—this being the better one for analysis. It is a pity that in making comparisons of this kind the calorific value of the gas is not given; this is an important consideration. However, taking case No. 2, "Hotspot" supplies the following information:

The charges in this instance were withdrawn as soon as the material reached the required temperature; the furnace time for each charge averaging 65 minutes.

CASE II.—Size of furnace: 54 in. by 32 in. by 24 in.

No. of Charge.	Weight.	Furnace Time.	Gas Used.
	Lbs.	H. M.	C.Ft
1	236	0 30	445
2	234	0 25	351
3	230	0 25	349
4	909	1 25	1455

In this case data are given for nine charges, but there is no need to reproduce the entire table.

Final results:

Gas per ton, including heating up. . . . . 4108 c.ft.
Gas per lb. . . . . 1·83 ,,

It is stated that the figures are very striking. Our comment upon them is that they are what one would expect from regenerative furnaces of the type on which the tests were conducted, and about 5 p.ct. better than could be obtained from gas-fired furnaces without regeneration, but which were correctly insulated, and had an efficient burner system. The figures, however, do not represent the best results of which the modern gas furnace is capable, as recuperative furnaces are available giving still higher efficiencies. To heat one ton of steel from 60° Fahr. to 1750° Fahr. (960° C.) requires 6·28 therms (628,000 B.Th.U.). To do this work, the table suggests that 4108 c.ft. of 465 B.Th.U. gas is required. That quantity of gas equals 19·1 therms (1,910,000 B.Th.U.). The efficiency obtained is therefore 33 p.ct.; and this is when the gas required to heat the furnaces after the previous day's run is included. If this is neglected, the gas required per ton of steel is only 3337 c.ft., or 15·7 therms, and the efficiency is therefore increased to 40 p.ct.

Electric Furnace Data.

With the foregoing, our contemporary brings into comparison figures calculated from results obtained with the Wild-Barfield electric furnace. Again two cases are given; and we take the second, which is as follows:

CASE II.—Average charge: 640 lbs. Average time: 56 mins.

Taking furnace measurements as 54 in. by 32 in. by 20 in., or again 4 in. less in height for the flat roof of the electric furnace: Energy put into charge 41·6 KW.-H.; heat losses, 11·7 KW.-H.,—total, 53·3 KW.-H.

KW.-H. per ton; 186. Gas per ton is given as 4108 c.ft.

Price of gas per 1000 c.ft. to balance electricity at 1d. per unit thus works out at 3s. 9d.

It will be seen that the figure quoted for the electric furnace is 180 KW.-H. per ton; and this is equal to 6·35 therms. The efficiency claimed is therefore 98·7 p.ct.; but no statement is made as to whether the current consumption includes that required to heat up the furnace. Against this claim, it is noted that, for a charge in the furnace of 640 lbs., the energy put into the charge is 41·6 KW.-H., while the heat losses represent 11·7 KW.-H. This means that the heat put into the furnace is 53·3 KW.-H., and the useful work obtained from the furnace only 41·6 KW.-H. Therefore the efficiency is 78 p.ct.

Question of Cost.

To the manufacturer the question of cost is the pre-eminent factor. Taking the cost per therm of the heating medium as the basis, it is clear that electric current at 1d. per unit represents 29·4d. per therm; but as against 1d. per unit, it will be observed that the price worked-out for gas is 3s. 9d. per 1000 c.ft. This is a figure which is not representative of the usual charges for gas for industrial purposes. For example, for some trade purposes in Widnes, manufacturers are supplied with town gas at 1s. 4d. per 1000 c.ft., and in Sheffield at 1s. 6d.; but, if we take 6d. per therm as a fair representation of the average charge for industrial purposes, it will be seen that for equal costs the electric furnace would have to be 4·9 times as efficient as the gas furnace. In other words, if the efficiency of the gas furnace is 33 p.ct., the cost of gas 6d. per therm, and the efficiency of the electric furnace 78 p.ct., the current would have to be obtained at 0·48d. per unit for equal fuel costs. With regard to the advantages claimed for electric furnaces, it is now possible to obtain gas furnaces with automatic proportioning burner equipment which will fulfil all the claims. If our contemporary requires well-authenticated working results for modern gas furnaces, British Furnaces Limited, the Davis Gas Stove Company, or any of the other makers would, we are sure, be willing to supply them.

"B.C.G.A." DISTRICT CONFERENCE AT BUXTON.

A Manchester District Conference of the British Commercial Gas Association is to be held in the Town Hall, Buxton, on Friday, May 20. The President will be Alderman A. W. Wall, J.P. (the Chairman of the Buxton Gas Committee); and the Vice-President, Councillor A. J. Potter (the Vice-Chairman of the Committee). An exhibition of modern gas appliances will be displayed in the new showroom of the Buxton Gas Department.

The following is the programme of proceedings at the conference:

Morning Session.

11.0 a.m. Welcome by the Mayor of Buxton, Councillor Wm. Goodwin, J.P.

1. Opening Address by the President of the Conference.
2. National Publicity. Statement respecting work and policy. Mr. F. W. Goodenough, C.B.E. (Executive Chairman, B.C.G.A.).
3. Discussion on "Putting Our Own House in Order." With short papers as follows:
   "Notes on Buxton Gas Service." Mr. F. G. Shaw, Buxton.
   "Linking Up." Mr. F. H. Robinson, Harrogate.
   "Progressive Management." Mr. H. Davies, Chesterfield.
   "Local Publicity." Mr. H. E. Bloor, York.

1.0 p.m. Adjournment for luncheon at Buxton Hydro Hotel.

Afternoon Session.

3.0 p.m. Public Conference.
Opening remarks by the President of the Conference.
Subject for discussion:
Atmospheric Pollution in Relation to Health.
Address by R. Veitch Clark, Esq., B.Sc., Ch.B., D.P.H., M.A., M.B. (Medical Officer of Health, Manchester).
Discussion. To be opened by Alderman C. W. Buckley, M.D., M.R.C.P., M.R.C.S. (of Buxton).
Followed by: Councillor W. Shipton, M.D., M.R.C.S., L.R.C.P., J.P. (Chairman, Buxton Health Committee).
T. Buxton Flint, Esq., M.R.C.S., L.R.C.P., J.P. (Medical Officer of Health, Buxton).

4.30 p.m. Tea.

HOLDER REPAIR BY METAL SPRAYING.

A successful application of metal spraying for the repair of damaged gasholder plates is described by Mr. A. Ranlov, B.Sc., Assistant Engineer at the Horsens (Denmark) Gas-Works, in the "American Gas Association Monthly." The holder in question was a two-lift one, with a capacity of 215,000 c.ft., and was thirty years old. The top section plates were apparently hopelessly damaged by rust at the uppermost row of rivets; and in consequence of the inconvenience and expense of resorting to the usual plan of replacing the defective plates, it was decided to make a trial of metal spraying. This it was possible to carry out while the holder was in service—a point of importance, having regard to the small available storage capacity.

METHOD OF PROCEDURE.

The corroded spots and strips were sand-blasted, in order to make them absolutely clean before the metal was applied. A 20 H.P. gas engine was employed to compress air to 85 lbs.; the compressed air being directed around the holder through a 2-in. pipe-line, from which the sand-blasting apparatus was fed by vertical pipes and rubber tubing. The sand-blasting was performed by a man working on a scaffold attached to the top-lift, and so travelling up and down with it. The sand-blasting made a great many holes in the plates, where the corrosion had gone deepest, allowing small amounts of gas to escape. As quickly as possible these holes were filled with wooden plugs; and the projecting ends of these were cut off, and the surface made as smooth as possible.

Having in this way treated the area within reach of the workman, zinc was sprayed upon the cleaned surface, covering the plates and the plugs with a thin zinc oxide about 0·05 mm. thick. The metal gun was equipped with a burner, which was supplied with gas at 45 lbs. pressure and compressed oxygen from steel cylinders. The zinc was provided as thread 1 to 2 mm. in diameter; the uniform advance of which was secured by a little compressed air motor in the gun. In the gas-oxygen flame the zinc was melted, and sprayed under the pressure of the compressed air. When the zinc coating was applied, it was immediately covered with a layer of tin sprayed upon it to a thickness of 2 to 3 mm., rising to 4 to 5 mm. over the wooden plugs. The rivet seams also were filled with tin. Afterwards the holder was painted.

The work was accomplished without trouble of any kind; and at present—two-and-a-half years after its completion—the metal sprayed strips and spots are in perfect condition. In fact, the method was subsequently adopted for similar repairs to holders in Copenhagen and other places.

THE NEW "A.B.C." MECHANICAL WATER GAS GENERATOR.

[Communicated.]

The relative merits of water gas production are generally known (Meade, "Modern Gas-Works Practice," pp. 690 *et seq.* Hardie, Presidential Address, Southern Association of Gas Engineers; "GAS JOURNAL," April 6, 1927. Cunnold, "Modern Water-Gas Plant," "GAS JOURNAL," April 13, 1927). Hence it is not proposed to enumerate them in this article.

There is an increasing realization of the necessity for water gas as an adjunct to the production of town gas in vertical or horizontal retorts; and though, owing to the price of fuel oil for carburetting, it is not likely that for some appreciable time water gas will be produced in this country to the same extent as in the United States of America (in Chicago, for example, there is a station producing over 50 million c.ft. of water gas a day). The latest economic figures would, however, seem to show that, considering the production of town gas over a period of years, including strikes and times of varying market conditions for coke, no gas-works could be considered complete unless it was in a position to produce a reasonable proportion of its make in water gas plants.

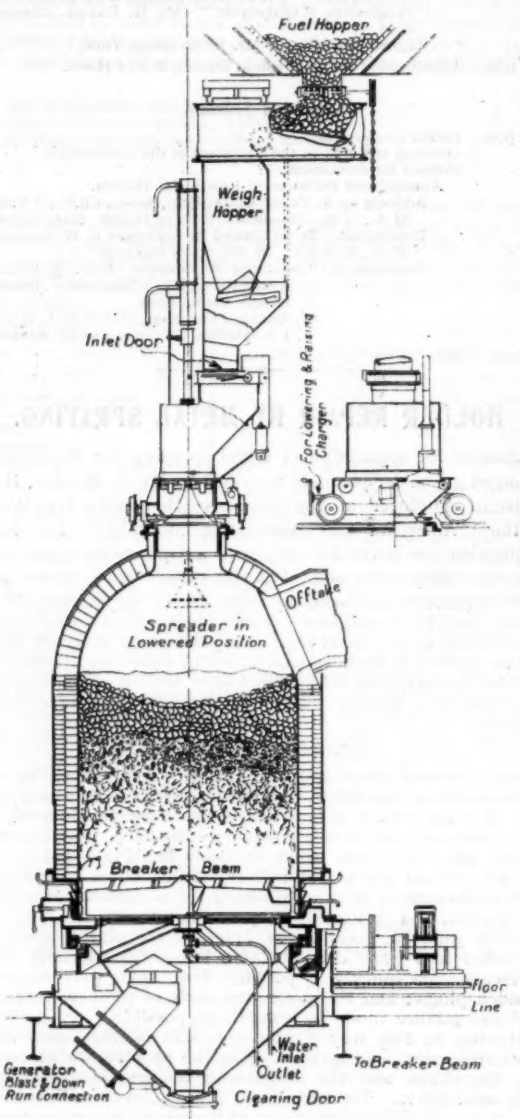


Fig. 1.—Section through "A.B.C." Self-Clinkering Generator.

As the developments in carbonization proceed, presumably tending in the direction of the larger and more centralized units of the coke oven type, the co-ordination of the various methods of gas production will necessitate an increasing employment of water gas. This method of gas making, with its allied systems embracing gas production in chemical works and steel works, is being scientifically developed in this country, the United States of America, and on the Continent; and lately a distinct advance has been made in America in the mechanical details.

In the paper "Modern Water Gas Plant" mentioned above, reference was made to a new self-clinkering generator. This is known as the "A.B.C.;" and the following considerations and details are presented of this apparatus, which has been described in America as "revolutionary." ("A Revolutionary Improvement in Gas Manufacture." C. J. Ramsburg, International Conference on Bituminous Coal, Pittsburg, 1926.)

Inherent disadvantages of the process of water gas manufacture are as follows:

1. The fire depth changes as the clinker accumulates.
2. The blast pressure varies in accordance with the resistance set up by the clinker.
3. Irregularities in blast and steam pressures cause channelling, and hence more clinker.
4. Loss of time while clinkering is taking place.
5. Loss of fuel consumed by natural draught while clinkering.
6. Loss of fuel as carbon in the ash.
7. Onerous manual labour to clinker (see fig. 2).
8. The necessity for spare plant to be in operation while clinkering, if uniform production is required.

Numerous poking and clinkering devices have been evolved, and some are in use; but frequently they have been designed to follow hand operations, as exemplified by mechanical pokers, mechanical means for breaking-up the clinkers, and so on. It is, however, much more advantageous to consider the mechanism of the formation of clinkers, and to apply, if possible, means for prevention. It has been found that, at the high temperature necessary to make good gas, clinkers are prevented if there is maintained a uniform density of fuel and a uniform temperature across the whole of any horizontal section of the fire bed.

When any conical bottom grate is employed, difficulties are immediately created, only to be overcome by extensive application of "trial-and-error" methods in the application of blast

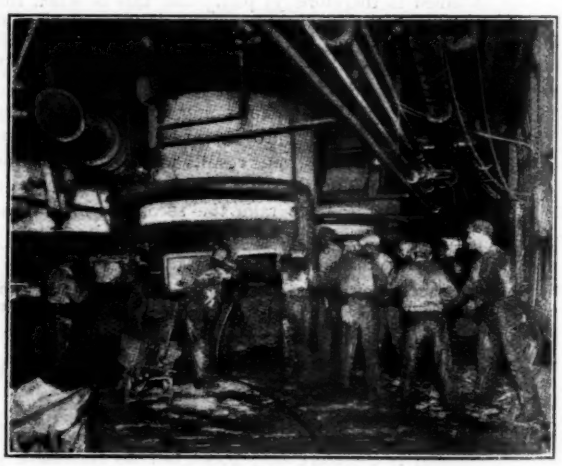


Fig. 2.—Present Method of Clinkering Non-Automatic Generator, twice daily at Chicago Bye-Product Coke Company.

and steam and design of grate. The necessity of a horizontal grate is thus clearly apparent. The latest theories of surface combustion justify the necessity for agitation of the fuel bed, apart from the fact that the variable nature of the fuel inevitably tends to cause channelling, which must be nullified by agitation. A slow wave-motion of suitable magnitude imparted to the fuel bed would appear to be as nearly as possible the simplest theoretical method of obtaining such agitation—particularly for closing channels as they form, and thus preventing the high-temperature stream lines which facilitate the formation of clinkers. With these considerations in view, the "A.B.C." mechanical generator has been evolved.

Fig. 1 shows views of this apparatus. The essential features are the horizontal grate and the agitator beam. The latter is of cast steel, water cooled, triangular in section, and about 15 in. high. It revolves at a given speed, which may be one revolution in from 20 to 100 minutes. The arm is slightly curved in plan from centre to the extremities. Thus an upward and slightly outward movement is given to the fuel—enough, in fact, just to vary the uniform theoretical density and pack the fuel against the wall somewhat, and thus prevent excessive blast and temperature along the wall; so preserving the lining. On one of the experimental runs, up to 80 p.ct. down-run steam was used, resulting in a more concentrated fire. The ash in the fire consequently melts, and runs well down into the neighbourhood of the agitating beam before solidifying, which invariably takes place before any agglomerating occurs. Thus clinkers in the ordinary sense do not form. In fact, it

was found that the maximum load against the agitating beam required only 4 H.P. on the peak of the working stroke of the ratchet-and-pawl drive.

Another feature of the generator is the two concentric chambers under the grate. The inner chamber is for the passage of the gases, and is about 2 ft. less in diameter than the inside of the generator. It was found that restricting the gaseous currents to the limits of the inner chamber deters them from concentrating along the walls, and assists in maintaining uniformity. The outer chamber is for ash removal, and is closed to the flow of gases. Two adjustable ploughs, one on each side of the generator, discharge into it.

The first machine, 11 ft. inside diameter, was put down at the works of the Chicago Bye-Product and Coke Company, where it operated in parallel with a number of other machines for a period of about twelve months. The following table shows the record of a continuous run for 25 days:

Fuel Used. Lbs.	Number of Runs.	Ash Removed. Lbs.	Remarks.
114,000	267	7,280	Average analysis of coke used—
129,900	261	9,135	Moisture, 1·5 p.ct.
121,100	263	10,395	Fixed carbon, 90·8 p.ct.
136,000	266	10,640	Volatile matter, 1·2 p.ct.
131,600	248	11,760	Ash, 8 p.ct.
123,400	234	10,570	
119,600	215	10,115	
133,900	250	10,250	
132,500	249	10,500	
133,000	255	12,150	
125,200	265	11,200	
117,400	257	10,500	
123,600	252	9,800	
95,900	202	9,520	
113,600	249	9,485	
118,100	274	10,955	
112,600	253	9,345	
112,700	264	9,870	
117,900	264	11,165	
118,800	263	10,865	
117,900	261	11,165	
106,300	252	9,205	
117,900	261	11,165	
112,700	264	9,870	
96,200	247	8,400	

On one occasion, when the machine was isolated for eight hours, the following figures were obtained:

8 hours:

Fuel used	46,500 lbs.
Gas made	1,516,000 c.ft.
Calorific value	409 B.Th.U. per c.ft.
Oil	1·44 galls. per 1000 c.ft.

Or for 24 hours:

Fuel used	132,000 lbs.
Gas made	4,500,000 c.ft.
Coke used per 1000 c.ft.	29 lbs.

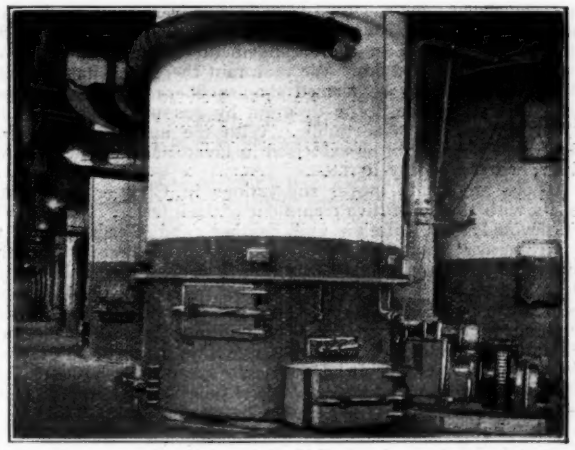


Fig. 3.—Continuous Clinkering, with "A.B.C." Self-Clinkering Generator Base.

On another occasion, on *coal*, when the mechanism ran equally well, and with almost better results as to clinkering, &c., the figures were:

For 24 hours:

Fuel used	100,000 lbs.
Gas made	3,900,000 c.ft.
Coal per 1000 c.ft.	28 lbs.
Oil per 1000 c.ft.	2·15 galls.
Calorific value gas	425 B.Th.U. per c.ft.

It was also calculated that the saving in fuel due to lower carbon in the ash removed was equivalent to about 2550 lbs. of coke per day, or 1·24 lbs. per 1000 c.ft. of gas. A further calculation was made as to the heat absorbed by the water cooling of the agitating beam, &c. This amounted to 14,000 B.Th.U. per minute, or approximately 1 p.ct. of the heat value of the fuel. Other types of self-clinkering mechanism have been calculated to lose up to four times this amount.

All the above results could, no doubt, be improved under English conditions; and further details from subsequent installations in America more than confirm the figures.

The apparatus represents a distinct step forward in gas-making practice, and, upon its adoption in this country, will not only improve the existing conditions under which water gas is made from an economic standpoint and in other directions, but will create a further incentive to the utilization of this increasingly popular adjunct to the production of town gas.

NOTES ON NEW BOOKS.

THE GAS SHOWROOM.*

The publication of this book, which follows closely on "The Modern Gas Showroom," shows that at last this form of publicity work is commanding, at any rate in some circles, the attention it deserves. It would be better for the gas industry if the appreciation of the value—necessity would be the more appropriate word—of showrooms was more universal. There are still those who regard expenditure in this direction almost in the nature of dead loss, which attitude is the result of short-sighted conservatism or prejudice, and of ignorance of the benefits which showroom premises bring to every gas concern, irrespective of size. Whatever can be said against competition, it has at least helped the gas industry enormously by shaking it free from the "take it or leave it" habit. Undertakings which have been subject to competition have practically without exception realized the need for educating the public to the advantages of gas and coke, and that a well-equipped, well-organized, and efficiently staffed showroom is an excellent medium for effecting this. The small concerns which up to the present have held sway unopposed will have to bestir themselves if they wish to avoid strangulation by electric cables.

There is a preface by Sir David Milne-Watson, a firm believer in showroom enterprise, as is evidenced by the whole-hearted policy of the Gas Light and Coke Company in this respect. He calls attention to the following phrase from the section of the report of the Weir Committee on "The National Problem of the Supply of Electrical Energy," dealing with sales development.

> All undertakers should be encouraged not only to sell apparatus, but also to provide showrooms and exhibit appliances with which they can demonstrate the numerous practical applications of electricity in the home.

This applies with equal force to the gas industry.

"The Gas Showroom," by F. Cornelius-Wheeler, with a Preface by Sir David Milne-Watson. Published by Ernest Benn, Ltd.; price 7s. 6d. net.

"The Gas Showroom" is divided into eight chapters; and in an appendix are collated the views of several well-known gas engineers on the subject. Chapter I. outlines in general terms the need for modern showrooms, and Chapter II. deals with the choice of a site. The next chapter is entitled "General Principles in Planning a Showroom Exterior." A drawing illustrates the plans of the front of the Trowbridge premises of the British Gas Light Company as they existed before being taken over by the Company, and as they now appear after alteration. The author explains that it was obviously disadvantageous to attempt to place the entrance centrally on a narrow frontage. "The entrance itself," he says, "was cramped, and the space left for window display was entirely inadequate for gas apparatus. In this case the Company was anxious, if possible, to have a double front, but realized that it was out of the question. The new front with the side entrance was finally decided upon." This is at variance with the description of the alteration to the Trowbridge premises given by the author of "The Modern Gas Showroom." In the latter book, photographs are included of the premises before and after reconstruction; and the finished showrooms have a central entrance flanked by effective windows larger than the original ones.

One of the photographs illustrating Chapter III. is of the Tooting Showrooms of the Wandsworth, Wimbledon, and Epsom District Gas Company, where there is an arcaded entrance. The windows are curved. This treatment may have been the most suitable in the circumstances; but there is no question that, wherever possible, curved glass fronts should be avoided. The light they reflect seriously impairs their utility and certainly irritates the onlooker. While the author does not mention this point, he rightly emphasizes the desirability of paying attention to the lettering on the fascia of a showroom. This should be dignified but unostentatious.

In Chapter IV. the problem of the lay-out of the interior of a showroom is considered. The author says that "there are

certain showrooms where a man instinctively removes his hat on entering the doorway." He regards this as a compliment to those concerned in the arrangement of the premises. We regard it as a mistake. We maintain there is a happy mean between what may be termed shop-snobbery and slovenliness; and this should be borne in mind by gas undertakings, who cater for such a wide public. With the author's suggestion that restraint should be exercised in lavatorial treatment, however, we thoroughly agree.

There are many useful suggestions in Chapter V., which deals with the decorative treatment of the interior. Chapter VI. is devoted to ventilation and heating, and Chapter VII. to "Economy" gas flue systems. The author emphasizes the need for co-operation between the gas industry and the architect and builder. He points to the saving in building cost which can be effected by providing gas flues instead of the old-fashioned, and now unnecessary, chimney breasts. Salesmen should, of course, take note that the wine of gas-flue economy has so influenced the heads of some speculative builders that they have in many instances "gone one better" by providing no flues at all.

The final chapter is on showroom organization. The author suggests that electric power is inadmissible in a gas company's showroom, and that electric vacuum cleaners are out of the question. This statement is far too "sweeping." Electricity can be generated efficiently by town gas, and a small gas engine driven generator constitutes a good demonstration unit. Electricity finds a place in gas-works. Why should it be taboo in a gas showroom? An intelligent public does not appreciate narrow vision, nor will it benefit the gas industry.

The volume is attractively printed, and the text is embellished by 31 photographs and diagrams. It is a welcome addition to the all too scanty literature on the promotion of gas sales.

PUBLIC UTILITY FINANCE.*

Review by George Evetts, M.Inst.C.E.

This volume is the first of a series entitled "Materials for the Study of Public Utilities." The Editors of the series propose to keep each volume within the limits of the subject-matter defined by the title; and in dealing with the finance, this task should not be difficult. It is probable that more trouble is met in keeping it within reasonable limits of size.

In drawing up this volume, the author has searched the technical periodicals, financial periodicals, and the proceedings of Technical Societies dealing with public utilities for the past fifteen years. He has very cleverly welded the information at his disposal into a comprehensive and readable volume by thoughtful selection of material, and by filling in the gaps with subject-matter of his own writing.

It will be realized that, owing to the difference in legislation dealing with public utility finances in America, the capitalization of public utility undertakings must be on a different basis from Great Britain. Whether considering railways, telephones, electricity, gas, or other industries, the essential differences in legislation, and the consequent relationship between the investor, the owning company, and the consumer, will render a perusal of this book of little assistance to the student requiring guidance in English practice. The differences in the financing of the company automatically create a difference from the investor's point of view, and in the creation of the rate structure. At the same time, any economist or student of public affairs who wishes to gain a knowledge of the financial basis of American public utility undertakings could not find a better book for his purpose.

The basis of capitalization, working capital, regulation of public utility issues, and the market are dealt with fully. The fixed capital charges, operating costs, and statistical tests used in the analysis of various utilities are fully considered, and there are most valuable chapters on depreciation and amortization, and the method of dealing with reserves, surplus profits, dividends, and taxation.

There is little subject-matter in the book dealing directly with gas affairs. Beyond occasional references—such as the dissection of the fixed capital account of gas undertakings, the effect of the load or diversity factor, the cost of gas in relation to sales, and technical units gauging the position of gas undertakings—gas as such is not considered. All the matters referred to are treated much more fully, and in accordance with English practice, in many of our own books. This volume, however, should have a much wider appeal, particularly to those responsible for the financing and regulation of public utility undertakings. The principles enunciated can be applied equally well to the administration of British public utilities; and the author is to be congratulated on producing a successful book from the material at his disposal. The selection of the material must have involved as much discretion in what to omit as what to include.

* "Public Utility Finance," by Walter E. Lagerquist. 664 pages and index. Published by A. W. Shaw Company, of New York, Chicago, and London; price $7.50.

A CATECHISM ON BOOK-KEEPING.*

This is an admirable book at a reasonable price. It is based on the question and answer system, and designed to enable anyone to acquire a practical knowledge of book-keeping with a minimum of expenditure of time and trouble. The questions form an easy, systematic, and complete course of instruction in the principles and practice of the subject. An appendix of eighty pages contains exercises and examination papers arranged to correspond with the order of the text. The work covers a wide field. The principles of double-entry are made clear, and, in addition to explanations of the methods of keeping the usual books of account, special attention is given to such important subjects as bills of exchange, partnership accounts, the accounts of joint stock companies, reserve and sinking funds, cost accounts, solicitors' accounts, and the accounts of executors and trustees. Though the volume is intended primarily for students, it has appealed to business men generally; and the publication of the Third Edition is the outcome of a continued demand.

* "Students' Catechism on Book-Keeping," by F. Davey. Third Edition: Published by Butterworth & Co.; price 5s. net.

DEHYDRATING WATER GAS TAR EMULSIONS.

A Continuous Process.

The Malden and Melrose Gas Light Company, after experimenting with other methods, are now treating water gas tar emulsion in a Warner type continuous distilling dehydrator; and, as described by Mr. R. S. Carter, the Company's Superintendent, in the "Gas Age-Record," the system of handling the emulsion and resultant dry tar is briefly as follows: The emulsion is pumped from the relief holder (in which several thousand gallons have been stored) and filter tanks into a large service tank, which is filled periodically. As the dry tar is made, it is transferred from a small underground tank to the main storage tanks. The dehydrating plant consists chiefly of the following apparatus: Emulsion supply tank of 1500 gallons capacity, automatic tar feeder, mixing tank, circulating pump, heat exchanger, spray piping, primary separating tank, reheating tank, final separating tank, dry tar storage tank, vapour take-offs from primary separating tank, reheater, and final separating tank, vapour condenser with oil and water separator, and small oil service tank. This apparatus makes up a complete emulsion distilling plant in convenient form.

Method of Operation.

From the emulsion storage tank the material is pumped to an overhead supply tank, from which it runs by gravity at a constant head to an automatic feeder. The apparatus is filled to a point slightly below a predetermined tar level. The circulating pump is then started, and steam is admitted to the heat exchanger until the material at the inlet of the circulating pump reaches a temperature of from 180° to 200° Fahr. This emulsion is dehydrated to about 3 to 6 p.ct. water. Heat is then turned on to the reheating tank slowly; and the emulsion to be treated is fed through the automatic feeder. The material circulated by the pump passes up through the heat exchanger, and through the spray piping, into a primary separating tank.

Here a large part of the water and light oil vapours separate from the tar. These vapours pass off to the condenser. The condensate flows to a separator, from which the oil runs to an underground storage tank and the water to the tar filter. Some of the partly dehydrated tar flows over to the reheating tank, where it is heated to about 260° Fahr.; and then it flows to the final separating tank, where the last vapours pass off and combine with the vapours coming from the primary separating tank just before entering the condenser. The dry tar (containing 2 p.ct. or less moisture) flows off to storage.

The dehydrator has been worked satisfactorily with emulsions containing over 50 p.ct. of water; but it is more economical to handle such emulsion in another manner, or to let it settle-out to less than 50 p.ct. water content before dehydration.

Coke Formation.

The results of a further research by M. Audibert, in collaboration with L. Demas, into the coking of coal was published in the "Revue de l'Industrie Minérale" in January last. The author suggests that the coking process takes place as follows: The coal particles first soften and begin to adhere to one another, leaving passages through which the gases escape. Owing to the high viscosity of the melted coal, these passages do not close up immediately. Increasing temperature gives greater fluidity, especially if the heating is rapid. If sufficient fluidity is attained, the gas passages become completely blocked, and the volatile matter can only escape as bubbles, which inflate the whole mass, causing intumescence. It is accordingly possible to have complete melting together of the particles without much inflation, if the viscosity of the melted coal remains high until setting takes place. Excessive intumescence is undesirable, as it leads to the formation of weak, highly porous coke.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

Mr. E. C. Holt, of the Gas Light and Coke Company, regards the introduction of the high-capacity meter as a blessing to the industry—an opinion with which there will be general agreement. He points to the many advantages of this new pattern; and his remarks on lubrication, and his outline of the improvements which have been effected in prepayment meters, are most valuable. Mr. Holt's wide experience gives great weight to his opinions.

A Meeting of the Association was held at the Westminster Technical Institute on Friday, April 22—Mr. Arthur Broadbent, of the Gas Light and Coke Company, presiding.

THE NECESSITY FOR HIGH-CAPACITY METERS.

By E. C. Holt, of the Gas Light and Coke Company.

Notwithstanding the vast amount of gas-consuming apparatus fixed during the past 25 years, the district staffs of gas undertakings have continued to experience difficulty in obtaining orders for certain additional appliances, owing to the local conditions and positions of existing meters, and the limited space still allotted to meters by architects and builders.

In some areas space is not so valuable as in others, but in the City and West-End districts so much importance is attached to it that it is still found difficult to get the comparatively small amount necessary for high-capacity meters of to-day. One particular instance of this happened about 18 months ago at a very large establishment in Oxford Street, when the Sales Department were arranging for a gas consumption of 4000 c.ft. per hour with a 50 p.ct. margin for overload.

This meant the installation of either three 300-light old-type dry meters occupying no less than 200 c.ft. of space (exclusive of connections), or a 1000-light wet meter in about 170 c.ft. of space, with the necessary water supply, weekly gauging, reading, &c. Serious objections were promptly raised by the firm concerned to both these types of meter, solely on the question of space. The matter was brought to my notice, and two 3000 c.ft. high-capacity meters were obtained, occupying only 50 c.ft. of space (exclusive of connections). These were duly accepted and installed; and these two meters have since been working satisfactorily, having registered together a total consumption of over 5¼ million c.ft. A great advantage to those concerned is the fact that these new meters can be fairly easily fitted high up on shelves, &c., on walls out of the way, leaving the floor space below clear. This would, however, be difficult with the old type of large meters, such as the 400-light, 300-light, &c.

Very many cases have, since that date, been dealt with in this way, and particularly at the premises of the leading newspapers in Fleet Street, where space is considered so valuable. No less than 36,000 of these increased capacity meters have been issued by the Gas Light and Coke Company alone during the past seven years, including over 12,000 of the very popular 50 c.ft. gas fire check meters in the old 2-light size of case, and a very large number of the 80 c.ft. automatic meters, which more usefully cope with this form of prepaid gas consumption, instead of the previous nominal capacities of 18 c.ft. for the 3-light, and 30 c.ft. per hour for the 5-light meter.

Among domestic consumers the same difficulty has often been felt where additional apparatus, such as a geyser or a gas fire, is required, necessitating at once a larger meter. In suburban residences or blocks of flats, &c., there is usually no room for a larger meter; and, in many cases, even if space can be found for a second meter in another position, the increased fixing charge often causes a consumer (who may be anxious to use more gas) to refrain from proceeding any further with the installation.

I am glad to say, however, that for some time past the possibility of losing such increased consumption has been considerably reduced, as meters of three or four times the capacity have been available, and installed in the same positions as the meters of low capacity.

The introduction of standard meters was undoubtedly an improvement, inasmuch as the capacity per revolution was increased, thus reducing the number of revolutions to pass a given quantity of gas; but as the "lights" type of meter was almost universally installed definitely to carry increased working loads ranging from 100 p.ct. in the smaller sizes down to about 20 p.ct. in the larger sizes, the standard meters formed only a period of transition in the progress of meter construction. At the same time, this alteration improved the registration of standard meters when overloaded; but, from the actual district point of view, the alteration was not carried far enough.

So far as the Company which I represent is concerned, we shall continue to repair and re-use the "lights" and standard types of meter, until they are beyond repair, for exchanges where the same size of meter is required; but a gradual change-over to the meters of increased capacity is taking place which will, in course of time, result in the ordering of only ten sizes of these meters instead of nineteen sizes of the "lights" and seven sizes of the standard types.

Alteration in Methods of Construction.

The increased capacity of the new meters has been accomplished by the following alterations in constructional details:

One of the most important alterations is the large increase in valve port area, two instances of which are as follows:

1. The old 3-light valve port area averaged 0·5 sq. in.
   The new 80 c.ft. (H.C.) in the 3-light case—the valve port area now averages 1·14 sq. in.
   The old 250-light valve port area averaged 11 sq. in.
   The new 6000 c.ft. (H.C.) in the 250-light case—the valve port area is now 41 sq. in.
   This principle applies throughout the series of new meters, and consequently has the effect of considerably reducing the frictional losses between inlet and outlet; the valves being duplicated, and connected to the four gas chambers as hitherto. This reduction in frictional losses, together with the top arms being crossed where desired, allows a longer stroke on the disc diaphragms, and increases the capacity per revolution; the number of revolutions being increased with very little pressure loss for the larger quantity passed.
2. In addition to this enlargement of valve areas, the inlet and outlet pipes have been increased, carrying the larger bosses with caps and linings, equivalent to the larger sizes of meter.
3. The surface area of the valve gratings has been reduced by some makers, in order to keep down friction and offer as little space as possible for the settlement of foreign matter on the valve surfaces, thus endeavouring to reduce the amount of unregistered gas.
4. Disc diaphragms are fitted, instead of the old bag type, resulting in steadier action and more travel, giving the increased capacity. It would appear that the semi-chroming of skins has been of considerable value in this important section of meter construction.
5. In some cases, the gas is brought directly into the top chamber of the meter, and in others by a pipe or duct directly into the valve chamber, thus eliminating the eddies due to the old type of tortuous channel pipes on the underside of the valve plate.
6. The makers are also improving the bearings of the top arms, flag rods, &c., to withstand the increased number of revolutions; but this would appear to be a precautionary measure only, as many years' experience with overworked meters has not shown any undue wear in these positions, so long as the metal used in the first place is of good quality.
7. I will give a few examples of the increase in capacity per revolution and the number of revolutions per minute in cases of equal dimensions.

Old "Lights" Meters. R.P.M.	Standard Meters. R.P.M.	High-Capacity Meters. R.P.M.
3-light case, 2·4	4	5·4
5-light case, 3	4	8
10-light case, 3·6	4	8

In some of the larger types of high-capacity meter, the number of revolutions is not appreciably affected when compared with the old "lights" meters—

150-light case, 3·3 R.P.M. for 900 c.ft. per hour . . .	2½	4 R.P.M. for 3000 c.ft. per hour
250-light case, 3·75 R.P.M. for 1500 c.ft. per hour . . .	2	4 R.P.M. for 6000 c.ft. per hour

This increase in the number of revolutions, though double (in two sizes) the standard speed, still leaves the maximum number at 8 R.P.M.; and when considered from an engineering standpoint, such a figure cannot by any means be regarded as one to cause much alarm. In fact, it is considered an absurdly low figure; and the result of seven years' experience with large numbers of high-capacity meters has proved this to be of little importance in the lives of meters, provided always that the resistance through the meter has been reduced.

One has only to consider the enormous number of 3-light automatic meters which have been in use for very many years, the times they have been overloaded during their lives, and the increased number of revolutions during that overloading. Yet in spite of these facts, the meters still have long lives, though it is safe to assume they were, more often than not, registering against the Company during the overloading. Moreover, those 3-light meters were rated at 18 c.ft. per hour, and when used with a cooker, &c., frequently were passing 60 to 70 c.ft. per hour. The number of revolutions in that case would be (18 c.ft. at 0·125 c.ft. per rev.) 144 per hour, but when overloaded would be (60 c.ft. at 0·125 c.ft. per rev.) 480 per hour, with slow registration. To-day we are fitting the 80 c.ft. meter to take any

such load at only 320 revs. for 80 c.ft. and 240 for 60 c.ft., with greatly improved registration.

Other notable alterations in meter construction have been made, mainly with a view to reducing the cost of meter maintenance generally. Some of these are given below, to which I will refer a little more fully presently under the heading of the "Maintenance Outlook."

A. Abolition of dial covers; a deeper dial frame being fitted with plate glass (¼ in. in thickness) to reduce the number of glasses broken.
B. Stuffing box fitted to dial spindle in meters with the open type of top chamber with the back of index encased. With the 80 c.ft. meter the revolutions of spindle in stuffing box are only one for every 2 c.ft.; but in the No. 2 Standard the crank revolutions in centre stuffing box are twelve for the same amount of gas passed.
C. Stuffing box fitted on the automatic shaft between the top chamber and the prepayment attachment, to reduce leakages at this point.
D. Grease tubes applied from top front of meter, to permit of recharging stuffing boxes in top chamber without removing the top of the meter.
E. A badge denoting the maximum working load of the meter is fitted on the right hand side of the dial framing.
F. Oiling device fitted to meters of 1200 c.ft. and upwards.
G. Painting of insides of the cases of larger meters.
H. The application of roller and ball bearings to guide rods and other parts of the larger meters.
I. A stop action is fitted in the automatic meters, to prevent their being overcharged with coin, resulting in coins becoming fixed.
J. Dual coin actions are now supplied by some makers, which permit of the prepayment attachment being altered in a simple manner *in situ* from 1d. to 1s. rating, or *vice versa*.
K. The fitting of corrugated expansion joints on flanged meters.
L. Larger money boxes are now fitted.

In connection with the improvement in the design and construction of automatic prepayment attachments, the following figures denote, to some extent, the situation in regard to the number of mechanical defects as applied to meters returned from the districts over a period of seven years.

Year 1919, average p.c. of defects recorded	12·61	
„ 1920, „ „ „ „ „	11·73	Average, 12·65 p.c.
„ 1921, „ „ „ „ „	12·55	
„ 1922, „ „ „ „ „	13·71	
„ 1923, „ „ „ „ „	9·18	
„ 1924, „ „ „ „ „	10 13	Average, 9·2 p.c.
„ 1925, „ „ „ „ „	9 41	
„ 1926, „ „ „ „ „	8 09	

Looking farther back to the pre-war period, I find that the figure for the year 1913 was 14·03 p.c.

It will be noted that the average percentage for the four years ended 1922 was 12·65, whereas the four years ended December, 1926, show an average of only 9·2 p.c. We are therefore receiving back under 1 p.c. of the total number of automatic meters on the district, all of which cannot be dealt with *in situ* (there are, of course, large numbers of minor defects dealt with on consumers' premises), but the general result seems to point to a gradual improvement in design and/or workmanship.

The introduction of the front change-plate for prepayment meters was made about the year 1920; and this undoubtedly has a good effect in regard to the defects of attachments of previous types.

Registration.

In connection with the overloading of meters of the "lights" type, it is often found that this leads to slow registration when tested at 2 in. pressure; in fact, the average percentage of error shown with slow results is usually double that shown with fast results.

Apart from overworking meters at the standard testing pressure of 2 in., and sustaining a variable amount of loss in this way, a further loss may be found to result in slow registration when the pressure is increased substantially beyond the 2 in. Matters were improved in this direction when the standard meter ratings per revolution were increased; but it is safe to assume that the later high-capacity meters have still further improved this, should they be overloaded, while the registration up to and at their rated capacities is thoroughly satisfactory. One has to bear this in mind when arranging gas installations. The meter may be regarded as automatically invoicing the goods to our customers. When the capacity for such "invoicing" is overdone, then we begin to lose. It is always better, therefore, to make allowance in the size of meter for future additions to the installations, not forgetting to see that the maximum hourly load in any premises is unlikely to exceed the badged rating of the meter.

This is so easily overlooked, particularly where there is a geyser in use. It has to be remembered that the rate of consumption of a medium-sized geyser when reduced to (say) 15 minutes for preparing a bath, may show a load varying from 2 to 3 c.ft. per min., or 120 to 180 c.ft. per hour.

It may then be found that only a 10-light or No. 3 standard meter is in use. What is the result? Let us assume that only twelve baths per week are taken at the rate of 40 c.ft. per bath. At this capacity—*i.e.*, 160 c.ft. per hour, and a pressure of 4 in., the meter will probably be found to be registering slow. Assume it to be only 5 p.c. slow, then an annual loss is sustained by the gas undertaking (under such conditions) of about 1240 c.ft. for each geyser of that particular size. Should a gas fire or other piece of gas apparatus be in use at the same time, the loss will be increased, and the poor meter is striving at its low capacity per revolution to keep the account as correctly as possible for the gas undertaking. More often than not, it fails to do so. If, however, the meter is removed and tested under the Sales of Gas Act at 2 in. pressure, it will probably prove correct in registration at its badged capacity.

I have here only referred to the geyser. Of course, the same thing applies when other types of gas apparatus are allowed substantially to overload the meter. There is also the possibility of the meter breaking-down under the strain in course of time.

Try to visualize such cases happening, and think of your own meter doing its best in such circumstances; and then think of the gas undertaking. It may be said, "What about the fast meters?" Well, I can here safely say that the percentage of error on fast meters is invariably proved to be only about half of that of slow registration; and when all allowance is made for this, the Company are still the losers. My best advice to all concerned with the installation of gas apparatus is to have a look at the capacity of the meter first, and think of that maximum load per minute.

I think this point is well-known by most gas men; but a little deep thinking about the loads per minute may surprise many, even to-day, especially after careful attention has been given by gas representatives who afterwards find that a private fitter has added several pieces of apparatus to the meter without their knowledge. Gas inspectors are only human, and, though most alert, they cannot be watching everyone on the district.

A review of the difference in results of meters tested as returned from the districts over the seven years ended December, 1925, is given below; and I suggest that this may be taken as some indication of what may be happening with meters in use on the district. Such results are apparently very favourable from a registration point of view.

Meters proved "slow." The average percentage of error has fallen gradually from 9·75 to 8·82 p.c. in seven years, and to 8 p.c. to December, 1926 (including Brentford meters).

Meters "passing unregistered gas" have gradually fallen during the past seven years from an average of 24 c.ft. per meter to 14 c.ft. per meter, and to 13·1 c.ft. to December, 1926.

Meters proved "stopped registering" have slowly decreased from 21·87 to 8·7 p.c. in the seven years period, and to 7·7 p.c. to December, 1926.

Meters proved "no passage" of gas have also declined during the seven years period from an average of 8·75 to 3·18 p.c. (December, 1925); and this has slightly increased to 3·27 p.c. to the end of December, 1926 (including Brentford meters).

Meters proved "correct" in registration have increased gradually from 33 to 38·77 p.c. in seven years (December, 1925); and for year ended 1926 it has increased still further to 41·16 p.c. (including Brentford meters).

It will be noted that the general improvement shown during the seven years ended December, 1925, has been further improved during the year ended December, 1926, with the exception of meters with "no passage," which show a small increase of 0·09 p.c.

During the year 1925, about 13 p.c. of the total meters on the district were returned for various reasons, including "cut-offs." This figure dropped during 1926 to 10·79 p.c., including meters from the Brentford amalgamated area; and it is hoped that this will be further reduced, though a certain amount of turn-over of meters is unavoidable. As the 10·79 p.c. of the total meters represents over 126,000, it will be noted that we have many opportunities of obtaining information in regard to their behaviour.

In addition to this, there were no less than 122,448 (excluding Brentford) new and repaired meters tested during the year ended December, 1926, giving a grand total of 248,448 meters tested during the year—all helping to keep our minds occupied and the customers' accounts in order, as far as possible. Of the 122,448 mentioned, this figure is made up as follows:

New ordinary meters	12,050
New auto „	15,148
Repaired ordinary meters	43 832
Repaired autos	51,418

Unaccounted-for Gas.

It is interesting that the total amount of gas unaccounted-for during the last few years has shown a gradual reduction. The figures kindly supplied to me by the Chief Accountant of the Gas Light and Coke Company are given herewith:

Years.	Gas Unaccounted-for, P.Ct.
1923.	7·2
1924.	5·9
1925.	5·03
1926.	3·85

These figures are on the corrected basis from 1924 to 1926; and it may be not unreasonable to assume that the standard

and high-capacity meters installed during the past few years have assisted, to some extent, in reducing the percentage of gas unaccounted-for. I am not without hope that the figure will in course of time be still further reduced, as the Company's scrapping scheme for old meters (which was introduced a year or so ago) has probably already helped in this direction by the installation of more up-to-date meters.

Pressure Loss.

One of the main objects during the construction of meters of increased capacity was to keep down the pressure loss and oscillation in the meter. This has been safely achieved, as the following test result will show, with three types of meter in one size of case.

Meter.	Rate per Hour. 80 C.Ft. at 2 In. Pressure.	At 10 P.Ct. Overload. 120 C.Ft. at 2 In. Pressure.
3-light old pattern . .	Loss 6 tenths	11 tenths
No. 2 Standard (same size case as above) .	Loss 4 ,,	6 ,,
80 c.ft. high capacity (same size case as above)	Loss 2 ,,	2½ ,,

This pressure loss with high-capacity meters to-day may be regarded as very satisfactory. Should they be overloaded, they will be found to be well within the limit allowed by the Sales of Gas Act—*i.e.*, 5 tenths, though we always expect to keep below 3 tenths—at the capacity of the meter. All samples are tested for this loss at fifteen rates of flow and four pressures.

Oscillation.

The oscillation point with high-capacity meters has also been improved to the extent that with the majority of the sizes this only varies, at the badged capacity of the meters, from 0·06 to 1 tenth at 50 or 60 p.ct. overloads. Samples are tested at about fifteen rates and four pressures for this purpose.

Testing and Examining.

The usual official general rules are observed in testing all meters. In addition to this, they are tested at 100 revs. per hour. The new increased capacity meter samples are subjected to no less than 60 registration tests at varying rates and pressures; and a very careful scrutiny of all such samples (and occasional examinations of bulk supplies) is made to see that the component parts meet with the Company's requirements. A careful examination of the parts of a new sample may take two or three hours for two examiners, such examination comprising no less than 97 constructional details. Meters have to reach a certain percentage of points awarded for 42 of the more essential constructional details. In addition to this, a large number of running tests under actual working conditions for some months, with weekly tests for registration and pressure loss, are made.

It may often be found after the first bench test with some new meters that they will prove, under working conditions, up to 5 or 6 p.ct. slow during the first week or so. This, however, will reduce to correct registration shortly afterwards, as the valves become "run in."

Some might say that all meters should be "run in" first by the makers over a period; but I am afraid that this would not be found to be a commercial proposition, as it would seriously retard the supply of meters to gas undertakings. The "running-in" of the valve faces on the premises after fixing is more advantageous generally, as the meter is not so likely to be disturbed for some time to come.

Under Clause 21 of the statutory rules dated 1920, meters may be required to pass the test at 100 or fewer revolutions, or be rejected. This is carefully carried out; and additional tests are often made at much lower rates of revolution.

Further sounding tests are also made. In fact, before a meter reaches the district, it has been submitted to no less than four such tests—*i.e.*, by the makers, the official test, and the Company's 5 in. and 10 in. tests.

Repaired meters have the paint washed off, and are then submitted to a very sensitive bubble test, which is equivalent to about 16,200 bubbles per hour to equal a cubic foot of gas. All our new meters are now received from the makers unpainted. This gives further opportunities for examining soldered joints, &c.

Oiling of Meters.

In connection with the construction of high-capacity meters, consideration has been given to certain forms of lubrication, two of which are worthy of particular attention:

A. The recharging or greasing of stuffing boxes.
B. The oiling of top gear and valves, &c., in the sizes of 1200 c.ft. and upwards.

In the case of A, the recharging of stuffing boxes situated inside the top chamber of meters is effected by means of two small tubes leading from the front gallery of the meter. The charging ends are positioned at each side of the index casing, where, by the removal of a small screw, grease can be injected, by means of a simple form of grease gun, through the tubes directly into the stuffing boxes, without the necessity for removing the top casing of the meter as hitherto.

This method will be found useful in manufacturers' workshops and repair shops of gas undertakings. No leakage of gas and no unregistered gas can be obtained through the tubes should the screws be purposely removed, and meters fitted with this greasing device are approved and stamped at the official testing stations.

In the case of B, though the lubrication of dry meters may not be considered an absolute necessity (as past experience with dry meters has proved), yet it has been found that mineral oil introduced before the meters are put into use acts as a very useful preservative of both the leathers and of the internal surfaces of the meters.

The lubrication of the working parts, such as the valve faces, the top arms, worm, &c., will undoubtedly prove of considerable advantage to the meter generally, helping to keep down noises usually resulting from friction due to parts of the meter becoming dry.

I asked the leading maker of the large sizes of high-capacity meters to make provision for a simple form of lubrication, which might be regarded as a valuable adjunct in extending the life of these meters. It is not intended that such a device should be dependent upon frequent attention for the purpose of adding fresh oil; but if lubrication is effected at the commencement, the oily film remains on the part of the meter for a period as yet undetermined.

The method of lubrication, already brought into satisfactory use in the meters of 1200 c.ft. and upwards, is by means of a small plunger pump operated from one of the top arms in the upper chamber of the meter; the pump being installed in the bottom of an oil chamber or sump, forcing the oil from the sump through a small tube to a distributing reservoir situated above the oil chamber and immediately below the top casing of the meter. The oil sumps vary in capacity with the size of the meter; and brass tubes of narrow gauge are carried from the reservoir to the lubricating positions, and cotton leads conduct the oil by gravity feed from the reservoir to these positions.

The oil feed is, of necessity, very small; the pump action being slow. All excess oil raised by the pump to the feed reservoir is conveyed back through a waste pipe to the sump, to be used over and over again. From actual experiment it is estimated that the oil consumption will not reach half-a-pint per million c.ft. of gas used. Though the quantity may be regarded as small, a further experiment is being made with a view to reducing it. The lubrication will only take place so long as oil remains in the top reservoir, which is only charged when the meter is working. From an experiment made at Haggerston, I estimate that a fresh charge of oil will not be required for some years, depending upon the use of the meter.

When necessary, fresh oil can easily be added to the chamber through a specially formed duct leading through the top of the meter case and terminating near the front; the end of the duct being suitably plugged by a brass plug properly wired and sealed to prevent removal. A proper oil seal is formed to this duct by an annular casing, which seal remains always charged, thus preventing any escape of gas at the filling position.

The fitting of the sealing plug on the outside, and the permanent form of oil seal on the inside, have been approved and passed by Official Testing Inspectors under the Sales of Gas Act. The energy absorbed by the pump is inappreciable, being insufficient perceptibly to affect the loss of pressure between the inlet and the outlet of the meter.

The oil used for lubricating is the same as employed by the Company for many years for the internal spraying of meters at Haggerston and Fulham. It is a solar distillate of between 0·854 and 0·874 specific gravity. This has been proved to have no deleterious effect whatever on the meter parts. On the contrary, it appears to be advantageous.

The deposition of oil films (during the spraying of meters) on the internal surfaces, and particularly in the top chamber, assists in arresting the fine dust and rust (which is carried into the meter from the piping and connections) from depositing on the valve faces, where they so often lead to noise, resulting in the "working-up" of the valve faces. This noise vanishes after an oil film has formed later on those faces. No matter how well designed and constructed meters may be, they are always subject to attack from such extraneous deposits.

An instance worthy of note was recently dealt with, where no less than two ounces of this fine rust, &c., was removed in loose form from the top chamber of a fairly new large meter. It was found to have scored the valve faces sufficiently to set-up a persistent squeaking, which, however, after an injection of oil, immediately vanished. The cost of fitting this oiling device is very small; and we are indebted to the manufacturer for developing the idea in such a simple and practical manner. This form of lubrication is very effective, and will undoubtedly extend the life of the meter. When viewed from an engineering standpoint, it will doubtless be regarded as a really progressive step in gas meter construction.

Painting of Internal Surfaces of Large Meters.

During the past few years, the preservative action of oil found in meters has been carefully noted (during the examina-

tion of old meters when set aside for repair, &c.), in conjunction with the preserving power of paint.

In many cases in the past, certain meters makers, when repairing meters, have painted some of the internal surfaces of the casings, &c. Such painted surfaces have always been found to be sound, and the paint has been unaffected many years after the date of repair and painting.

The internal surfaces of the larger meters are now being painted as a precaution against corrosion; special attention being paid to the valve plate, which, once corroded, renders the meter beyond repair.

Improvements in Prepayment Attachments of Meters.

Marked improvements have been made in the design and construction of prepayment attachments of meters during the past few years. The most important change was the introduction of the front coin plate, with its simple method of altering the rating to suit variations in the price of gas. Since its introduction, only meters of the front plate type have been purchased by the Gas Light and Coke Company. The plate facilitates the work of price-changing, compared with the amount of work required with the old "wheel" type of meter. Though the number of "wheel" meters still in use in the Company's area is approximately 200,000, this is being reduced year by year as the meters become too costly for repair.

This alteration of automatic meter prepayment attachments, when the price of gas varies up or down, is a difficult matter to handle. It necessitates the training of about 350 men, to enable them safely to alter the various rating devices. Then there is the equipment of tools, &c., to enable the men to carry out the task in conjunction with the coin collectors, who are required to clear the money boxes at the same time. During the recent alteration in price, no less than 201,000 new gear wheels had to be obtained for the old types of meter, in addition to which three tons of sealing wax and over two tons of tapers were used.

It is obvious, therefore, that the introduction of the front rating plate has more than justified the change-over from the wheel type, though at the commencement some of the manufacturers had not given sufficient margin in the new plate rating to cover a rise in the price of gas to the recent figures of 12, 13, or 14 c.ft. for 1d. These meters had to be specially dealt with, though their number is comparatively small.

Since the introduction of the automatic meter, many types of prepayment attachments have been in use on the Company's area. Consequently, this alteration of so many types becomes increasingly difficult to handle. It points to the desirability of reducing the many types of attachments to the lowest possible number compatible with the prompt delivery of new meters. In view of the many types in use, little or no encouragement should be given to the purchase of fresh patterns which may be submitted by manufacturers as mere selling points.

We have given much attention to this important matter of attachments during the past four years. In dealing with high-capacity meters with some manufacturers, we have received valuable assistance in this direction by their concentrating on, and supplying us with, one type of attachment, instead of the many patterns hitherto supplied by them. The reduction of types is of great assistance to both the automatic section of the rental department, who deal with auto meter complaints, and the meter works, where the stocks of parts must be kept. Further progress is expected in this direction. It is a point of great importance to gas undertakings.

In addition to the "plate" type of attachment, another useful change in design has been made whereby only one pattern of meter need be stocked for issue as "penny" or "shilling" rating. This alteration is made in a few minutes by removing and reversing a gear wheel, together with a slight alteration to the coin carrier, without the need for special tools. This attachment is of value to gas undertakings, particularly where storage space is limited. It also permits of the alteration from 1d. to 1s. (or *vice versa*) being made on consumers' premises when necessary, without exchanging or removing the meter.

Maintenance Outlook in Regard to the New Types of Meter.

Many of the details mentioned previously under the heading of "Alterations in Methods of Construction" have a marked effect on the general cost of meter maintenance. A few of the most important are given herewith:

(*a*) The abolition of dial covers in favour of a deeper dial frame fitted with plate glass (⅛ in. in thickness). This was introduced about five years ago at the Gas Light and Coke Company's request, as it was found that the number of cases where the index glasses were broken was increasing, due mainly to the thinness of the glass and the dial frame then used. The change-over to the thick glass has had a remarkable result, inasmuch as the number of new glasses broken has been reduced to a minimum. The last figures extracted to the end of the year 1925 denote that only 24 of the new thick glasses were broken, out of 167,842 meters issued with them, over a definite period, whereas no fewer than 4105 meters with thin glass were returned during the same period. In fact, new glasses now seldom break. This means a big saving in the cost of exchanging meters for this form of complaint.

(*b*) Stuffing box between top chamber and auto attachment, to reduce leakages at this point. During the designing and construction of the new high-capacity auto meters, the makers were asked to fit this additional stuffing box to prevent leakage of gas into the money box, &c.; and it may be safely stated that a large proportion of district complaints reported were due to the leakage of gas in this position. With the new high-capacity meters, a horizontal stuffing box situated on the stop valve shaft, where passing through the side of the meter, is now supplied. While no appreciable difference in loss of pressure is found, this innovation will undoubtedly result in a large reduction in the number of complaints, in course of time.

(*c*) A stop action is now fitted in the auto meter attachment, to prevent overcharging the meter with coins when the amount which can be prepaid (as denoted on the prepayment dial) has reached its maximum. Attempts to force a coin into meters without this new stop action often result in the coin becoming jammed. With the new stop action, coins cannot be inserted when the maximum position of prepayment has been reached.

(*d*) The dual coin device has already been referred to.

(*e*) Larger money boxes to the new auto meters are now being fitted. These are of value to the automatic rental section, and will tend to reduce the number of calls to clear full money boxes of smaller dimensions.

(*f*) Corrugated expansion joints on flanged meters. These are now being fitted to the larger high-capacity meters; and such joints will reduce leakage at flanges, and obviate exchange of meters for this reason. Much damage can be done to large meters by that last turn of the chain tongs, &c., when fixing. The new joint obviates this.

It may now be regarded that the experimental period of the new high-capacity meters is over. Frequent examinations of some of the earliest specimens issued between six and seven years ago have been made by withdrawing the meters from the district for this purpose, and they have shown no undue signs of wear. Meters of increased capacity have been produced in small quantities for many years past to suit special conditions, but no particular consideration appears to have been given by any maker to their manufacture on general lines. We are today, however, indebted to the manufacturers for the marked progress made in this direction.

One of the special meters referred to was returned from the Company's district a few weeks ago. This was rated at 750 c.ft. per hour in a 50-light case. This meter has been in constant use supplying a large gas engine for over fourteen years, and had been registering at rates of flow varying from 200 c.ft. per hour up to its capacity. It was returned owing to the case developing a leak. After the leak was repaired, this meter was specially tested, and proved to be "correct" in registration at its capacity, and only 2 p.ct. slow at 1000 c.ft. per hour (33 p.ct. overload) with a loss of pressure of slightly over 2 tenths, and an oscillation of only 0·15 tenths.

Tests of additional samples are still proceeding, as certain manufacturing firms have been somewhat diffident in taking-up this question of meters of increased capacity, viewing it, perhaps, as revolutionary. The demand is, however, growing; and it is hoped that in course of time they will be producing this type of meter. This progressive step in meter construction, following rather closely on the introduction of the standard meters, though necessitating certain alterations in design and construction, has also helped towards solving the difficulty of prices experienced in the meter trade some time ago.

Discussion.

The Chairman remarked that Mr. Holt's paper, which the Association had thoroughly appreciated, contained a vast amount of information on the improvement in the design and manufacture of meters. Those on the district welcomed the high-capacity meter, which occupied small space, and was extremely useful for installing where the old-type meter of a size suitable for the increased demand was too bulky. The author had laid stress on the question of the overloading of meters, which resulted in disadvantage to the gas undertaking. Overworked meters were apt to pass unregistered gas, or to register slow; and this no doubt had something to do with unaccounted-for gas. High-capacity meters gave a greater working margin; and their installation would, no doubt, have the effect of reducing the figure for unaccounted-for gas.

Mr. J. H. Goldsmith (Hon. Secretary of the Association) asked what corrections were made for unaccounted-for gas. He also observed that overworked meters tended to increase the figure for unaccounted-for gas. New meters were often found 5 p.ct. slow, due to initial stiffness. He asked the author what lubrication was given to new meters, and how long the lubrication was effective in the smaller meters.

The Question of Electrolysis.

Mr. F. C. Smith (Gas Light and Coke Company) said that the pressure drop through a meter depended on the amount of energy necessary to move the working parts of the meter and on the pressure of the gas. Could the author tell them in what parts of the meter the pressure loss occurred. Regarding paints for meters, certain pigments appeared to be more effective than others. Was iron oxide paint used by the Gas Light and Coke Company? Iron oxide sometimes found its way under the valve plates. Could the author tell them whether, when the liquor removed from meters was allowed to stand in contact with air for some time, iron oxide was precipitated? Also had the number of meters returned as a result of electrical damage increased recently? Many expected that there would

be more damage from electrolysis now than in the past. Had it ever been considered a practical proposition to insulate meters against electric currents?

Mr. F. S. LARKIN (Gas Light and Coke Company) remarked that the author's experience with such a large Company as the Gas Light and Coke Company naturally added weight to the opinions he had expressed; and the way in which the paper had been presented denoted the large amount of time which Mr. Holt had taken to condense a great deal of information into simple form. The introduction of high-capacity meters had been mooted many years ago; but whether it was that the manufacturers held back, or that the managements of gas undertakings were afraid to venture on the new project, the fact remained that until recently no big steps had been made in the development of this type of meter. In the past the fixing of the number of revolutions per minute at which a dry meter should operate appeared to have been done by rule-of-thumb methods, and means for eliminating back-pressure had not been properly considered. The high-capacity meter, however, had gradually departed from what could be termed a tinman's job to what was now undoubtedly an engineer's job. On the problem of oscillation, Mr. J. G. Clark had done some interesting work at Watson House. He had an apparatus there by means of which the movement of the liquid in a gauge attached to the meter could be thrown on to a screen. This proved valuable in the examination of meters. Before the high-capacity meters had been taken up by the Company, special tests were carried out; and the results bore out their faith in them. To his mind, the future success of this type of meter was assured, for it was consistently accurate at varying rates, even at such low consumptions as 25 to 50 c.ft. per hour.

ADVANTAGE OF HORIZONTAL STUFFING BOXES.

Mr. J. C. WATERS (Croydon) said that in Croydon they had used high-capacity meters for nearly two years, and had found them most advantageous for installation in Council houses, where little room was available. More discrimination was needed in installing meters. If, for example, an 80 c.ft. per hour prepayment meter was fixed, it should be ascertained that the maximum load did not exceed this amount. Their experience at Croydon had shown that high-capacity meters, with their two stuffing boxes, and those 2 in. long, eliminated index leakage. It was important that the diaphragms should be clear of sides, bottom, and top. The industry's thanks were due to the Gas Light and Coke Company for their excellent work in connection with meters.

Mr. W. L. WESTBROOK (North Middlesex) suggested that something should be done by architects and builders to provide adequate accommodation for gas meters, if possible away from electric meters. Mr. Holt had mentioned that the high-capacity meter ran at an increased speed. Would this affect the life of the meter? He (the speaker) had found that when high-capacity meters were worked beyond their stated capacity, they registered slow. Was it a practice of the Gas Light and Coke Company to insert a coin to make sure that the prepayment mechanism was working properly? Regarding the figures for pressure loss given by the author, Mr. Westbrook thought these were rather high. His tests did not indicate such a great loss. He had been interested to learn that meters registered slow until the valves were run in. The front price changer was a great advantage. Mr. Westbrook asked what was the procedure when coins became fast in prepayment mechanisms after business hours.

THE SCRAPPING OF METERS.

Mr. W. T. KENSHOLE (Lea Bridge), regarding the scrapping of meters, suggested that working by date alone could not be regarded as satisfactory. Discrimination was necessary. For example, a meter in (say) a church, working only on two or three evenings during the week, could not fairly be compared with a meter in constant use on either business or domestic premises.

Mr. S. C. WALDOCK (Gas Light and Coke Company) inquired what type of man was employed for the work of altering and adjusting the prepayment mechanism.

THE AUTHOR'S REPLY.

Mr. HOLT, in his reply, explained that the correction of gas unaccounted-for referred to the usual corrections for temperature, pressure, &c. Where in some cases new meters might be found to register on the slow side, they would be correct during the primary and official tests. The slow registration might occur shortly after the meters were put into general use—the time he referred to in the paper as the "running-in" period. In a week or so, the valve faces settled down to the normal, during use; and he considered this an advantage, as the registration under such conditions became still more reliable. Regarding the oiling of new meters, he stated that for many years past the Gas Light and Coke Company had sprayed all new and repaired meters before issue. Though the period during which the oil film lasted was as yet undetermined, they had, however, much evidence of its existence in valve chambers, &c., some years after the original spraying. The oil spraying of a glass-cased meter would be found of considerable use in proving that the oily vapour searched and covered every part of the interior of the meter, particularly with the "open top" meters of to-day.

Replying to Mr. Smith, he remarked that there must of necessity be a slight loss of pressure in overcoming the inertia of the meter. So long as the gas had to pass through the various chambers, the additional loss of pressure might be accounted-for by the combination of small eddies which still existed, and the skin friction of the gas in contact with the various internal surfaces. The figures given in the paper showed the progress in this respect, which was due entirely to cutting-out, as far as possible, the resistance through the meter. It had since been found possible further to reduce the small amount of pressure loss. The paint used for internal coating of meters was of an oxide basis. He had not actually analyzed the liquor removed from meters; but in the works they were glad to get rid of this as quickly as possible. While no definite record was kept of meters damaged by electrolysis, the number of instances appeared to have fallen off during the past 18 months. It was his practice to advise the district inspectors of such occurrences, and ask them to have the meter position altered. In course of time this would have a good effect. However, the number of cases appeared to be inappreciable. The question of insulation of meters had been dealt with on several occasions; but it was not a commercial proposition.

Mr. Holt thanked Mr. Larkin for his remarks. He could confirm the statements made by Mr. Larkin regarding an increased capacity meter. He found his own to be most consistent in registration. The average load of an auto meter might be between 20 to 25 c.ft., but the rating 80 c.ft. for the 3-light case was determined so as easily to cover the maximum load on the average slot installation.

All high-capacity meters supplied to his Company had a small "maximum hourly load" badge fitted at the right-hand side of the dial case, in an endeavour to keep the importance of that maximum load before all concerned. It was their experience, however, that the new type of meter was more capable of dealing with overloads up to 30 or 40 p.ct., with improved registration, &c., than were the older types of meter, though he agreed that the line should be drawn at the marked maximum. He also agreed that horizontal and longer stuffing boxes should considerably improve conditions, and reduce the liability of leakage. In regard to the action of the disc diaphragm as compared with the old bag type, the former was a much steadier and definite movement. The risk of wear to the leathers was much less than with the bag type, owing to the rolling action, instead of the rubbing action. The present-day method of dressing leathers was a marked improvement over previous methods, and tended to lengthen their lives.

Replying to Mr. Westbrook, Mr. Holt said he was of the opinion that gas salesmen were generally on the alert, and were in close touch with architects and others, to ensure that proper space was provided for the meter in new buildings, &c. He realized, however, the great difficulty they must experience in some cases. The increased speed of the new meters would not alarm him at all, if the manufacturers continued to supply the correct metal for bearings, &c. He quoted a case when an intensive test had been made with gas to the extent of 2 million c.ft. used in one of his shops with a 420 c.ft. meter. Both the manufacturer and he were satisfied, as a slight polishing of the moving parts, where they rubbed, was the only sign of wear that could be traced. It was not their experience that the new meters proved consistently slow when overloaded. A large number of meters tested were found to be within the Act up to 100 p.ct. overload. Prepayment meters were all tried with coins before issue.

[At this stage Mr. W. A. HARRIS, of the Gas Light and Coke Company, explained in detail the process adopted whereby the valves of all auto meters are closed by hand. Air is passed through the meter on a bubble test, which denotes when the valve is soundly closed.]

In regard to pressure losses, these were recorded for sample meters by an oil manometer, which was a more sensitive instrument than the ordinary water gauge, and was more easily read. Of course, the usual correction was made for the specific gravity of the oil.

Mr. Holt asked the President to reply to Mr. Westbrook's query as to how fixed coins were dealt with after office hours.

The PRESIDENT explained that the usual procedure was that, if the collector could not attend, the meter was exchanged. Failing this, in urgent cases the seal of the meter was broken by the fitter, and the job booked for special attention next day.

Mr. HOLT said that he found that no parts were accumulated with the dual type of coin action which his Company were using, as it only meant reversing the wheel and adjusting one part of the coin carrier. Replying to Mr. Kenshole, he stated that his Company's meter scrapping scheme was based on cost of repairs to meters, and not on an age basis. Very old types of auto meter were, however, disposed of as they were gradually returned from the district. Replying to Mr. Waldock, Mr. Holt said that it was the rule for an experienced auto repairer to be placed on this work, and not the general district fitter. The alteration was primarily arranged with the auto collector; and any discrepancy would show on the index.

Mr. S. A. CARPENTER (North Middlesex) proposed, and Mr. G. H. LLOYD (Gas Light and Coke Company) seconded, a vote of thanks to Mr. Holt, which was carried with acclamation.

Flue Gas Analysis.

In the February issue of "Fuel in Science and Practice" it is mentioned that during last year an American firm, the Bacharach Industrial Instrument Company, fitted their electrical CO_2 and CO recorders (which work on the well-known thermal conductivity system) with an integrating device enabling the average percentage of CO_2 (or CO) in flue gas during any desired period to be ascertained. It consists essentially of an electrolytic electricity meter; the bath being phosphoric acid, and the electrodes platinum. The hydrogen liberated by electrolysis is collected and measured, and is, of course, proportional to the total quantity of electricity that has passed through the cell. Dividing this by the time of collection, the average current through the cell is obtained. To be able to deduce the average CO_2 content from the average current, it is necessary that the actual current at any one time should be proportional to the CO_2 content of the gas at the same time. A current for fulfilling this condition is ready to hand, being in fact the current which works the CO_2 indicator. The hydrogen collecting tube is graduated to give directly "p.ct.-hours" of CO_2 (or CO).

Manchester and District Junior Gas Association.—The Association will visit the Donnington Works of Messrs. C. & W. Walker, Ltd., on Wednesday next, May 4.

INSPECTION OF GAS-CONSUMING APPLIANCES IN AN AMERICAN CITY.

In our editorial columns for March 30 (p. 794), we referred to the work that is being done in inspecting gas appliances in an American city, and promised that, in later issues of the "JOURNAL," we would review the instructions which the Company in question issue to their gas-supply inspectors. We may recall that our engineering friend who forwarded the information asked us not to mention the name of the city to which it referred.

PRELIMINARY.

As a preface to a review, our correspondent gave these particulars: In the case of this Company, gas-supply inspection work refers to the visits made periodically to the house of each consumer for free examination of the conditions of gas supply and adjustment of appliances, and the free remedy of these troubles—charging only for repair part of an appliance, or for a system of piping, &c. The inspection work was started about seven years ago; and in about four months' time three complete rounds of the city will have been completed. In all there are about 485,000 consumers. It is computed that there is failure to gain entrance to about 17 p.ct. of the total houses visited, because no one is at home. The number of refusals to admit when someone is at home is negligible. Based on the number of appliances in houses and on the age of the house, workmen will complete from 15 to 25 jobs per nine-hour day. The total cost per job is about \$0.35, of which approximately \$0.31 is production and overhead labour; the remainder being for transportation, material, and sundries. The nucleus of the inspection team numbers 25; and this is augmented during slack seasons of the year in the Distribution Department district shops by about the same number. In other words, instead of laying off the regular shopmen at slack seasons, they are placed on gas-supply inspection work—thus benefiting not only individually, but having a reserve force of shopmen ready at any time to attend to seasonal increase in the shop work. The inspectors operate in gangs of from five to eight men in various parts of the city. In addition to this work, which is described as "periodical maintenance," the Company spend each year about \$150,000 in looking after complaints as received concerning fuel and illuminating appliances. This is termed "request maintenance."

A REVIEW OF THE INSTRUCTIONS FOR GAS-SUPPLY INSPECTORS.

It is explained that the general information and rules in this document are a summary of the instructions which have been given to the inspectors in the training school, or from men whom they have accompanied while doing work in the houses of gas consumers. The inspectors are advised to familiarize themselves thoroughly with all the features of the "instructions" by frequently studying them. It is also intimated that the Company intend always to keep the rules up-to-date, and to advise workmen of all changes—not only by word of mouth, but in writing. The inspectors are informed that no workman is permitted to do work in a way not allowed by the rules. Should he think it advisable that exception should be made in a particular case, he must mention the matter to the supervisor, who obtains authority from his foreman.

ORGANIZATION OF "FORCE."

The supply inspection work is under the direction of the Distribution Department. To a large extent, the work is similar to that done by the district shops. The men in both these "forces"—the inspectors and the shopmen—are interchangeable at the will of the foreman; and there are equal opportunities for advancement in both spheres. The inspectors who are transferred to the shops during any busy periods are advised to seize the opportunity to increase their experience and their value to the Company.

RELATIONS OF EMPLOYEE AND EMPLOYER.

In the next section of the "Instructions," it is pointed out that the employee is naturally desirous of making himself as valuable as possible to the Company; and the Company are just as desirous of having him develop as rapidly as possible. The following suggestions are made to help in this desire:

(*a*) Study rules carefully, and follow them exactly. If you find it impossible or impractical to follow them in any individual case, act according to your supervisor's instructions. Do not, however, continue to deviate from them, but refer each doubtful case to supervisor. When any feature requires a change in methods of work, the written rules will be changed promptly.

(*b*) You alone can make your record good, bad, or indifferent. If you work continuously, efficiently, and do each job well, you can be sure your work is satisfactory, and will be appreciated. Do not let the example of other men influence you in such a way that your record will be spoiled.

(*c*) When an idea occurs to you, think over the subject carefully, try to foresee possible objections to it, be prepared to answer questions about it, and then, if you still are convinced it is valuable, talk it over with your supervisor. If he sees objections, he will tell you so; and, if he thinks your idea valuable, he will talk it over with you and the foreman in charge. Keep your eyes and ears open, and make suggestions. They will help you.

(*d*) If at any time you wish advice or information about any feature bearing on your work, your future, &c., do not hesitate to talk to the foreman in charge.

RELATIONS WITH PUBLIC.

Under this heading, the employee has the following wise instructions given to him:

> By entering the employ of the Company, which is engaged in serving the public, you acknowledge that you are a servant of every consumer of gas, and agree to perform this service in accord with the Company's policy, which is: (*a*) To be courteous under all conditions, and to refrain absolutely from any impudent or questionable answers or conversations; (*b*) to make no misrepresentation of conditions; (*c*) to do each job thoroughly; and (*d*) to keep each promise you make, or, if for any reason it is impossible to do so, to make a proper and prompt explanation of the matter.
>
> When dealing with consumers inclined to be unreasonable, ill-tempered, or even abusive, show every possible courtesy and carefully avoid show of temper. By conducting yourself this way, you not only work for the interest of the Company, but for your own best interests.
>
> You are prohibited from giving the consumer any advice or information about subjects not explained in this set of instructions. However, never fail to state clearly to a consumer the proper course to pursue when he speaks of some unsettled question with the Gas Company. Never leave him under the impression that you will report it, unless instructions tell you to do so. Whenever you know that another Company man will call for any purpose, be sure to notify the consumer to that effect.

The clause proceeds to instruct the inspectors not to discuss alleged high bills, or the amount of gas escaping from a leak, amount burned by certain appliances, and the time required to heat water for a bath, on the ground that so many variable factors are involved with which he may be unfamiliar. The prohibition is not made because the Company wish to withhold information from their customers, but only to ensure that it is given by men who are better qualified to impart it. The inspector is advised to suggest to the consumer who makes a formal complaint regarding matters such as those referred to above, to call at, or telephone to, the office where bills are paid, or if the consumer refuses to do this, then the inspector should mention that he himself will refer the matter to the office.

THE OBJECT OF GAS INSPECTION.

It is pointed out that gas-supply inspection work is being carried out in order to make sure that every consumer of gas will periodically receive the services of a trained mechanic to examine his gas-using appliances. Every gas appliance is a kind of machine, and all machinery needs periodical attention. The Company are desirous that all appliances shall work properly and satisfactorily. They know from experience that many consumers are unable to tell when a gas-consuming appliance is not acting properly; also that much incorrect advice is given, and improper adjustment is made, by persons who are ignorant of the construction of gas appliances. Therefore, the Company have found that the only way to make sure that everyone has a chance to have his gas appliances adjusted and investigation made of other possible troubles is for a representative to make a visit to the premises. The inspector is urged to mention the details, to any consumer who indicates ignorance, of the free service the Company give, and request him to use it whenever necessary.

DEPORTMENT AND HABITS.

Several salutary hints are given in this connection. The employees are urged to be courteous in all circumstances. Cleanliness in person and clothing is expected; and there are other rules as to general conduct which should make the inspector a *persona grata* to all consumers. A novelty in this connection is that, when the inspector has obtained permission to enter a house, he places a standard iron door tag bearing his name in a conspicuous place above the letter-box, or in a crack between the front wall and the door casing, at such a height that children are not tempted to disturb it. This door tag is for the purpose of letting the supervisor and fellow workers know where the inspector is. The inspectors are warned not to enter any premises without the consumer's knowledge. On obtaining admission, the consumer has to be asked in what respect the service is unsatisfactory, and, if necessary, the inspector must explain that, in order to remedy troubles ordinarily found in the appliances, a few simple investigations of the supply must be made. The course of procedure is described in, for example, cases of missing meter shelves, tampered meters, and the exchange of prepayment meters for ordinary ones.

PRESSURE AND STOPPAGES.

So far the information has been more or less of a general character; and this brings us to the more technical aspects of the inspection work as practised in this American city. In the

preface to this, it is pointed out that a consumer knows when a gas service is satisfactory by the proper or improper operation of his appliances. If, however, any one or more of the appliances do not perform the work which the consumer thinks it should, the service is unsatisfactory; and it is the duty of the inspector to remove the cause of the trouble. It is pointed out that one thing without which no consumer's service can be satisfactory is a good gas pressure at each appliance. We quote *in extenso* the "Instructions" referring to this matter, as they will enable the procedure to be compared with the reader's own practices:

In every part of the city, the pressure in the street mains is sufficiently high to produce good gas pressure at the consumer's appliances, provided that there is no stoppage in the service-pipe, meter, house-pipes, fixtures, or appliances. A stoppage at one or more of these points is the cause of most troubles. Your work, therefore, will consist to a large extent of locating and removing stoppages.

Test for Determining Existence of Stoppage: When you first enter the house, the consumer will tell you of the various points at which trouble exists. You should not attempt to investigate or to remedy these troubles until you have determined whether or not the service-pipe and the meter are in good condition. To determine this in the ordinary dwelling in which are used a gas range and lights, and perhaps a water heater, it is necessary for you to light enough burners to place what is known as a "load" on the service and the meter. To do this proceed as follows:

(*a*) Light one light on two separate figures on first floor, including, if possible, a light which you can see while you are standing at the gas-range.

(*b*) Light top and oven burners of range one after another, not turning any off after lighting, and observe whether or not the lights or the burner flames become lower, or start to flicker or jump, as you light more and more. If the lights and flames remain steady until all of the range burners are lighted, you have proved that there is no stoppage in the service or the meter; and you can be sure that any poor pressure condition you find at any light, fixture, or fuel appliance is due to a stoppage somewhere between the meter and the place you find the poor pressure.

NOTE: If you are unable for any reason to light the gas range burners, or if the burners are dirty or obstructed, adjust them properly before making the above test.

(*c*) While you are lighting these burners, ask the consumer whether or not the lights you have lighted grow dimmer when the range is lighted. This will give you information which will help you in locating a stoppage in the system, if any exists.

Locating and Removing Stoppages near Meter: If, during the process of lighting the gas-range burners one after another, you observe that both the range burner flames and the lighting burner flames which you lighted previously grow smaller, you have determined that there is a stoppage at some point in the system supplying gas to both the range and the lights. If the pipe which supplies the range is separate from the pipe which supplies the lights, the stoppage must be on the meter side of the point where those two pipes are connected. To determine just where the trouble is, close the meter-cock, loosen outlet meter union, open the meter-cock, observe pressure at outlet, and close meter-cock.

Locating and Removing Stoppages in Meter: If the pressure is good, the trouble must be on the house side of the meter. If the pressure is poor, disconnect and take down meter. Look for condensation in meter columns, and remove it. If the meter is extraordinarily heavy, it may contain condensation within its body, in which case, follow Rule 18. [This deals with the disposition of condensation.]

Locating and Removing Stoppages in Service and Meter Connections: If no condensation is found in the meter, open the meter-cock, and observe the pressure at the open end of the inlet connection, and close meter-cock. If pressure is poor, do not attempt to investigate the matter further. Reconnect the meter, and report to your supervisor at once.

Locating and Removing Stoppages between Meter and Appliances: If during the process of lighting the burners of the gas-range or the hotplate one after another while the burners on the first floor are lighted, the range burner flames grow smaller and the lighting burners are not affected, then you have determined that the stoppage is in the pipe which supplies the range, and is somewhere between the range and the point where the range supply-pipe is connected to the other gas-pipes near the meter. If a range or a hotplate with two or more burners is connected with tubing, the tubing possibly is the cause of the trouble. Tell the consumer that complete satisfaction cannot be obtained until an iron pipe connection is installed, and endeavour to obtain an order for its installation. Make the best adjustment you can, lighting only one burner at a time. Investigate the line for traps, and remove condensation from them, if you are permitted to do so.

If the consumer tells you, in answer to your questions, that the lighting burners grow dimmer as one after another is lighted, and you find the gas supply to range sufficient with all its burners lighted, you have determined that there is a stoppage in the piping which supplies the lights only. This means that the stoppage probably is in the house-piping at the bottom of riser. You should unscrew the plug at that point, and remove the stoppage, if found.

Locating and Removing Stoppages at or near Appliance: If the consumer tells you, in answer to your questions, that trouble exists only with individual lights or with lights on individual fixtures, you should proceed to investigate as follows, leaving the top burners of the range lighted:

(*a*) Attempt to remedy faulty condition by adjusting the burner by varying the gas and air supply.

(*b*) When you find insufficient pressure, remove by-pass key (if any). If there is good pressure there, and if the plug or barrel of key is not obstructed, you have definitely located the trouble in the burner, and should proceed to remove it.

(*c*) If there is poor pressure at the by-pass key after removal, you have proved that the trouble is between this key and the meter.

(*d*) Next remove the fixture key or unscrew light and by-pass and remove obstruction, if found. If there is poor pressure at the fixture key, the stoppage must be between it and the meter.

(*e*) If the poor flow continues, unscrew fixture. If there is good pressure here, the trouble must be in the fixture; and it now probably can be easily removed. Perhaps you may have to remove all the lights from the fixture while doing this work.

(*f*) If there is poor pressure at the pipe outlet, the stoppage lies between that point and the main supply line.

(*g*) You may or may not be able to remedy this trouble yourself. To do so, shut off gas, disconnect meter, apply your mouth to pipe, and blow hard, connect meter and turn on gas.

Stoppages Accompanied by Flickering Flame: The preceding discussion about investigating and removing stoppages applies principally to poor pressure conditions which are unaccompanied by a flickering or jumping of the gas-flame. When this flickering occurs, it may be due to one of the following causes:

(*a*) Condensation in piping. A flickering flame, for example at the gas-range only, or at one light only (if properly adjusted), while all the other flames are steady, would indicate water in the piping supplying the range or the light.

(*b*) A jumping flame at all the burners may indicate a water stoppage in the meter, or it may indicate a defective meter, known as a "works catch" meter, or an overloaded meter, known as a "too small" meter. It is difficult to distinguish between these three causes until you have had experience; and if you decide a "jump" is due either to water or a defective meter, you should refer the matter to your supervisor, unless he has instructed you to do otherwise. If a jumping flame at all the burners is due to water in the service-pipe, proved by a fluctuation in the pressure at the meter-inlet after you have disconnected the latter and opened the meter-cock momentarily, you should refer the matter to your supervisor at once.

Inability to Remove Stoppages: If you are unable to remove stoppages in house-piping, and if together with your supervisor you are unable to remove stoppages from the service or meter connections, report the facts, and order piping pumped on Form 205, under "Shop Work Still Needed."

(To be continued.)

SCOTTISH JUNIOR GAS ASSOCIATION

(WESTERN DISTRICT).

The Western Juniors brought their 23rd Session to a close on Saturday, April 23, when many members made the journey to Dundee, to see some of the activities of the Gas Department there. The visitors were conveyed to the tar works, where Mr. Macdonald (Works Manager) and his assistants explained the processes carried out there. Then the gas-works were inspected under the guidance of Mr. James Dickson (Engineer and Manager) and his staff. The Dundee Gas Department have 60 vertical retorts of a combined capacity of 4,200,000 c.ft. per 24 hours, 456 horizontal retorts of a combined capacity of 3,192,000 c.ft. per 24 hours, and a blue water gas plant, consisting of two sets by Humphreys & Glasgow, each capable of producing 750,000 c.ft. per day. At the tar works, in addition to two stills of 5056 gallons per day, and a similar one in course of erection, there are a Wilton dehydration plant and a Woodall-Duckham tar and bitumen mixing plant. At the conclusion of the tour of the works, the party were entertained at tea by the Gas Committee.

Bailie FINN (Convenor), who presided, extended a welcome to the visitors. His Committee, he said, were always glad to assist those who were anxious to help themselves, and thereby help the industry they served. At present gas was up against keen competition from the electricity industry. He thought that, instead of antagonism, there should be more co-operation. Each industry had its part to play in the lives of the community. So long as the gas industry had Junior Associations whose first aim was to study the problems of the industry, then he had no fear regarding the future of gas.

Mr. JAMES HALL (President) returned thanks to Bailie Finn and the Gas Committee for their welcome. No better aid, he remarked, could be given to Juniors than facilities to see other works, hear their problems, and compare experiences. It all went to make efficient gas engineers. The Western Juniors felt they were visiting an old friend in Mr. Dickson, who, in 1916, received them in Johnstone.

Mr. DICKSON said he was as much a Junior to-day as he was in 1904, when he sent a letter to the Technical Press setting forth the opinion that the time was opportune for the formation of a Junior Gas Association in Scotland. He remembered the first meeting of the Western District; since when the Association had gone from strength to strength. During all his time as a Gas Manager, he had never experienced a decreased sale of gas. In Dundee in 1904 the output was 690 million c.ft.; in 1926 it was 1800 millions. In the near future they hoped to sell a great deal of gas to industrial consumers.

MAINTENANCE OF CONSUMERS' APPLIANCES.

By an American Gas Engineer.

I imagine that a number of us on this side of the Atlantic have been much interested in your recent maintenance conference. Even though we have surrendered the lighting field to electricity for reasons which we have considered adequate (undoubtedly the surrender has been hastened by a common ownership of gas and electric companies), the best opinion in the industry is a unit in advocating proper maintenance of everything on the consumer's premises, in order to obtain the best possible utilization of our product.

Our leading companies have always recognized their interest in the condition of appliances and piping beyond the meter outlet, and have usually, on request, furnished free of charge all the labour necessary to make supply adjustments and care for minor leaks and stoppages in piping. Material needed for appliances and extensive repairs to piping have been charged for at cost. This is known as "request maintenance." Recently, with the growing number of gas-using appliances in each home, some companies have started "periodic maintenance," involving a house-to-house inspection of all appliances, generally with no charge for labour, and costing, possibly, one-third of a cent per 1000 c.ft. each year, and in a large situation ensuring a visit to each consumer every two or three years. In addition to this, there are special inspections made at least once a year to automatic water heaters and house-heating apparatus with gas as fuel.

Coupled with this maintenance, either request or/and periodic, beyond the meter outlet, goes careful attention to the service pipe and meter. The latter is always set by the company and connected to the house piping. The size of both service and meter has, for thirty years or more, been considered from the standpoint of a long look into the future. Because the difference between the pipe cost of ¾ in., 1 in., 1¼ in., and 1½ in. is so small a percentage of the total cost of a service—especially where a renewal for increased size will involve paving disturbance—the leaders of our profession have been, since the '90's, using no size less than 1¼ in., and in the case of cities where apartment houses prevail 1½ in. for service pipe. In meters, the smallest size now bought has a capacity of 150 c.ft. per hour under 0·5 in. loss of pressure; and some companies have adopted 225 c.ft. as their minimum. The 3-light size, and some of the older makes of 5-light, are condemned for inadequacy on removal.

These enlightened practices, coupled with publicity as to the desire of the company that everyone should receive an adequate supply at all times, are doing much to render gas indispensable for many purposes, and to create a favourable public opinion. Of course, there is still much to do; and electricity is invading certain fields, such as cooking and heat-treating of metals, to an extent that would not have been possible had the gas industry been more alert at the right time.

In obtaining any field of use for which gas is peculiarly adapted, and for which obtaining means holding, the writer has often wished he had the opportunity of trying certain methods. His ideas received much encouragement about twenty years ago, from the action of the local telephone company. Having abundant capital, because allowed to pay attractive dividends, this company appreciated that the way to prevent competition was to place its own telephone in every house that would probably be a permanent user. Therefore, it offered to a selected list an installation free of expense, with a charge of 5c. for every call within two miles, and graded charges for longer distances. Everyone accepted this; and when, after two years, we were told that the existing charge would be changed to a fixed rate per month, including many free calls, few discontinued service. In this way competition was prevented, and many people got a telephone service, with all its benefits, much sooner than they otherwise would have done.

Along the same line, the writer has always believed that there is in our climate the opportunity for far more gas heating as an auxiliary to our main heating system, usually coal, than our companies now enjoy. The average consumer has been slow to appreciate the benefit of a small gas heater to warm a bedroom or bathroom quickly, or to furnish a small amount of heat in days in early autumn or late spring when the main heating system is not needed. A judicious loan of such heaters for a few months' trial would probably result in few returns and in appreciably increased heating sales. The sale of appliances on long terms—sometimes eighteen months—is, of course, a great help to widening gas use; but the free trial plan, if carried out with judgment, should prove of peculiar advantage.

These more or less random remarks can end in no better way than by commendation of the remarks of the "Salesman of the British Empire" (the Prince of Wales) as quoted in your editorial of March 2, p. 501.

SCOTTISH JUNIOR GAS ASSOCIATION (WESTERN DISTRICT).

[At this meeting, Mr. James Macleod, who is Manager of the Glasgow Corporation Chemical Works, surveyed the working of his Department during the past few years, and showed how it benefited the Gas Department. Regarding the present position of bye-product ammonia as serious, he considers that it will become worse, for bed-rock has not been reached in the cost of synthetic sulphate. He thinks that standardization of refined tars is the wisest precaution against competition from imported or artificial rivals for road purposes.]

There was a good attendance at the annual general meeting of the Western Juniors which was held at Glasgow on Saturday, April 9, under the chairmanship of Mr. James Hall, the President.

The Hon. Secretary submitted the annual report, from which we give the following items.

Annual Report of Council.

Your Council have pleasure in submitting their annual report on the work of the twenty-third session. The total membership is now 355, and consists of one patron, 34 honorary members, and 320 ordinary members—a decrease of 8 from last year.

The most important work in the Council this year was in connection with the Education Scheme of the Institution of Gas Engineers. The Junior Associations throughout the country were asked to attend a joint conference in London, so that the Advisory Committee would have an opportunity of discussing with the Juniors the present difficulties of students, and of hearing any objections to the general working of the Scheme. Your Council made careful inquiry into the whole matter, and submitted a memorandum to a meeting of all Junior Associations.

The British Juniors also submitted a memorandum; but as this proposal meant the complete overthrow of all co-operation with the Education Authority, your representatives could not agree to support the British Juniors. As all the other Associations agreed, it was left to the Scottish Western to submit a minority report at the main conference. This minority report was duly submitted, and was commended and approved of by all the speakers of the Advisory Committee. The Council are confident that, as a result of this conference, students in outlying districts will have more facilities for obtaining tuition, especially in ancillary subjects.

The British Junior Gas Associations have invited the Scottish Western to affiliate; and as they are prepared to accept our constitution, your Council recommend that we accept the invitation.

The prize for the best paper read last session has been awarded to Mr. Ronald Keillor for his paper on "Surplus Heat."

The Council recommend a donation of £5 5s. to the North British Association of Gas Managers, for the Education Scheme.

The financial statement showed a credit balance of £49 18s. 10d.

The following office bearers were appointed for next session:

President.—Mr. Robert Fife, Kilmarnock.
Vice-President.—Mr. John Murray, Glasgow.
Hon. Secretary and Treasurer.—Mr. Thomas Carswell, Glasgow.
Council.—Messrs. Thomas Gray, B.Sc. (Chryston), James Greig (Dawsholm), Alex. Bujnowski (Glasgow), Alex. Shand (Falkirk), Ronald Keillor (Greenock), and Samuel MacGowan (Dalmarnock).
Auditors.—Mr. M. E. Collier (Glasgow) and Mr. C. Gill (Glasgow).

TAR AND AMMONIA.

By James Macleod, F.I.C., M.I.Chem.E., Manager of the Glasgow Corporation Chemical Works.

[Extract.]

As most of you are aware, my work during the past two years as Manager of the Glasgow Corporation Chemical Works Department has been concentrated on one certain aspect of the gas industry—namely, the liquid products side (*i.e.*, tar and ammonia liquor, and the production therefrom of saleable materials). In these days, when one hears so much about the "valuable residuals" to be obtained from the carbonization of coal, particularly at low temperatures, it is probably not out of place to consider the actual position from a more definite standpoint of actual fact, as illustrated by the working of the Department under my charge. I must not be thought of as be-

fitting the value of the liquid bye-products, but merely as looking at the position without undue optimism of any kind. The financial results of this Department since its inception may be seen from the following table, which indicates the return to the Gas Department from its liquid residuals.

1. Year Ended.	2. Gross Revenue.	3. Excess of Income over Expenditure (being amount handed to Gas Department).	4. Costs of Tar and Ammoniacal Liquor at Arbiter's Prices.	5. Difference (being amount received by Gas Department in excess of Arbiter's Tar and Ammoniacal Liquor Cost).
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
May 31, 1921	527,442 6 8	378,846 15 3	329,721 8 7	49,125 6 8
,, ,, 1922	311,490 2 11	165,619 19 6	133,579 0 4	32,040 19 2
,, ,, 1923	412,000 19 9	275,568 5 7	246,071 17 11	29,496 7 8
,, ,, 1924	456,012 19 1	270,787 5 3	244,004 14 7	26,782 10 7
,, ,, 1925	369,073 1 0	193,407 14 11	147,847 9 5	45,560 5 6
,, ,, 1926	380,236 9 11	189,408 4 10	153,794 14 4	35,613 10 6

In addition to the figures shown in column 5, there was paid to the Gas Department the following sums for interest on the capital value of the works:

	£ s. d.
Year ended May 31, 1921	9,278 11 8
,, ,, ,, ,, 1922	15,606 3 2
,, ,, ,, ,, 1923	21,672 9 0
,, ,, ,, ,, 1924	24,654 13 2
,, ,, ,, ,, 1925	23,451 15 0
,, ,, ,, ,, 1926	22,465 5 11

Certain people who do not see eye to eye with the Corporation on the question of its dealing with liquid gas residuals have expressed adverse views as to the financial returns of the Chemical Works Department; and consequently I welcome this opportunity of showing by the above table the entirely erroneous nature of these views. There is little to be gained by any policy of suppression of material facts; hence I give the figures quoted in the table, to make my point clear that so far the result of this Department's operations has been of substantial advantage to the Gas Department.

The ammonia side is unfortunately under a heavy cloud; the market price now leaving no margin for profitable working. What the position is in the Chemical Works Department can be seen from the following average figures taken over the results of the four works; sulphate of ammonia being produced at each.

Sulphate of Ammonia—Average Costs per Ton.

Month.	Sulphate of Ammonia Produced.	Cost of Production.	Cost of Delivery.	Cost of Production and Delivery.	Cost of Ammoniacal Liquor (included in Cost of Production).	Cost of Production and Delivery *less* Cost of Ammoniacal Liquor.
1926.	Tons.	£	£	£	£	£
June . .	568	13·164	0·556	13·720	2·921	10·799
July . . .	441·2	12·204	0·647	12·851	3·013	9·838
August . .	451·5	12·377	0·719	13·096	3·001	10·095
September .	429·1	13·140	0·868	14·008	2·856	11·152
October .	444	12·670	0·611	13·281	2·931	10·350
November .	652 95	11·634	0 726	12·360	2·933	9·427
December .	803·35	11·191	0·568	11·759	2·951	8·808
1927.						
January . .	700·2	10·859	0·663	11·522	3·074	8·448
	4490·3					
Average .		12·005	0·650	12·655	2·964	9·691

Average price received from Federation for six months ended Nov. 30, 1926 = £10·196 per ton.

Referring to the foregoing table, you will see the actual costs obtaining in this Department over the period in question. You will note that when the Arbiter's valuation is placed on the liquor transferred from the gas-works to the chemical works, a heavy loss is shown per ton of sulphate produced; and even when this figure is deleted, and the liquor taken-in free of charge to this Department, a profit of approximately 10s. 1d. per ton is shown—the average cost being £9·691, and the average price received from the Sulphate Federation for the six months to Nov. 30, £10·196. It should be stated, however, that considerable repair work has been going on at the sulphate plants over the period in question; and this has some bearing on the cost of production. Nevertheless, the position is, as you can see, a very serious one. Serious, however, as it is at the moment, it is far from having reached its worst.

Competition.

It is idle to think that bed-rock has been reached in the cost of production of synthetic sulphate with several of the Continental countries engaged on various synthetic processes and with one highly successful synthetic process in use in this country. Improvements tending to still lower cost of production are almost certain to take place, with a further lowering of the price. From a paper in the American Institute of Chemical Engineers' Transactions, it would appear that the approximate price of synthetic sulphate is about £9·383 per ton; but I have been told of much lower costs than this. There is another aspect of the question. Large quantities of sulphate are exported from this country—indeed, we look to export sales to keep our stores clear—but coincident with these sales we are selling to our British farmers at a price considerably higher than his Continental confrère has to pay. Can this position be continued, or will it tend to modify itself by giving the British farmer a better chance by granting him his principal fertilizer at a lower rate? If the latter aspect of this question is the ultimate one to be adopted, then still less money is in view for us for our sulphate. Our natural nitrogen competitor, Chile nitrate, is also being reduced in price; and competition from this source will tend to become keener. It therefore rests on us to make every effort to cheapen the cost of sulphate. Some hope of relief in the cost of acid used might come from the shutting-down of inefficient sulphuric acid plants by the operation of Imperial Chemical Industries.

Again, there is the possibility of using another source for the sulphate radicle, such as gypsum. My research staff have been investigating this source. Failing a reduction in costs on the two lines indicated, what remains? Evidently, from Dr. Carpenter's speech at the annual meeting of the South Metropolitan Gas Company in February last, attempts are being made to find a way out on novel lines; and we await the results of these experiments with keen interest.

The Effluent Problem.

What I have indicated above, however, does not fill the cup so far as sulphate of ammonia is concerned. There is likely to be yet another charge landed on its already overburdened shoulders—the cost of reducing the oxygen absorption capacity of the effluent liquors from the plant. In other words, municipalities which have spent enormous sums in laying-down sewage disposal works will refuse to have their work partly nullified by effluents from sulphate plant. This attitude—and I have much sympathy with it—will ultimately involve serious efforts to improve sulphate effluents. This matter is, of course, now in the hands of a Special Committee; and on the recommendation of this Committee we may have to spend money in improving affairs.

No matter how the improvement is effected, however, some further charge against the sulphate side seems assured. The actual decrease in sulphate returns for the financial year to the end of last February is no less than £17,000.

Economies.

Steam raising is an item on which something might be saved on the sulphate side. It is somewhat apt to be side-tracked, because the fuel is generally breeze from the gas-works, which is not regarded as of high monetary value. In these days of efficiency and economy, every care should be taken to use even the cheapest article to the best possible advantage. So far as the Glasgow Corporation Chemical Works are concerned, a strong effort has been made to get down to bed-rock in the way of fuel economy in steam raising, and thereby to reduce the cost of sulphate production.

The question of why sulphates produced under slightly varying conditions differ in their moisture absorbing capacity in store has been engaging attention; and I hope soon to be able to publish some work on this subject.

The handling of the dried sulphate has also given us a good deal of thought; and at Provan the scheme soon to be completed involves the installation of a rubber belt conveyor to take the salt from the drier to an overhead floor or bin at one end of the building, whence it falls by gravity through discharge doors to the weighing floor. Thence it can be discharged by shoots to railway trucks or road vehicles, or dropped through to a storage floor sufficiently high above ground level to permit of loading to lorries. The motor driving the above belt is 3 B.H.P. The old scraper conveyor took 20 B.H.P. I am also contemplating the use of belts to take the salt from the centrifugal to the drier. The small power required for them is extremely attractive. The study of levels in the handling of sulphate is important, and conducive to considerable economy. For example, by simply reversing the drier at the Tradeston Works, and taking advantage of 7 ft. difference in level, the cost of handling was reduced to one-third the previous figure.

"Tar," in the words of Dr. Carpenter, "is suffering from a boom;" and this will, for the time being at least, prove a blessing to gas undertakings heavily hit by the past coal calamity. Dr. Carpenter has given clear reasons why this strong position should not be unduly pressed home.

Bitumen, which includes both the natural product and the petroleum residue, has always been a competitor of tar for road work. The excellent propaganda of the British Road Tar Association, however, is having its effect; and at present tar is easily maintaining its position. Certain defects are apparent in roads made with bitumen—notably the lack of grip on the surface, which causes skidding of rubber-tyred vehicles. On the other hand, the ready-made asphalte slabs and the "hot-ironing" method of surfacing prove convenient, and make an excellent road. It is unfortunate that the present shortage of tar has nullified, to a certain extent, the progress

made by the Road Tar Association; and bitumen is being used in cases where tar is unobtainable.

Tar Emulsions.

Research of the last few years has involved a new class of road-binder—namely, emulsions of water with tar or bitumen or both. It is common knowledge that well-bound surfaces cannot be made in wet weather with tar (or bitumen for that matter); and this proves a serious handicap. Water-tar emulsions overcome this by their faculty of absorbing the water on wet aggregate, and thus covering all surfaces. The subsequent breaking of the emulsion by exposure to the air leaves a film of tar having all the usual adhesive properties. At the same time, cumbersome boilers and tackle are unnecessary; and small road repairs such as filling potholes, &c., can be carried out at any season with little trouble. This emulsion branch of the tar industry is growing in importance, though it is not likely to supersede ordinary refined tar. Emulsion repairs are not so permanent.

Mixtures of refined tar and the bitumen residue from petroleum oils are becoming more popular under various trade designations. The most frequently used percentages of bitumen are 20, 25, 40, and 50. It is said that these mixtures have advantages over both constituents. There is less tendency for the road surface to crack in frosty weather, and less oozing in hot weather. At the same time a good non-skid surface is produced.

The temporary shortage of tar is affecting the insularity of Scotland. The North of England production of tar is at least up to normal, and in excess of local requirements. Consequently a market is being sought north of the Border with greater effort than in previous years. English tar distillers are much more organized than we in Scotland. Combines have been formed in various districts on co-operative lines and profit-sharing bases, to collect the tar from all sources within the area, and refine it at some central works. Such companies as the S.W. Tar Distillers, the Midland Tar Distillers, and the Yorkshire Tar Distillers are now well-known. There is much to be said for such an arrangement; and the time is opportune for a combination of tar distillers and producers in Scotland on the same foundation.

Variation in Tars.

The tars my Department has to deal with vary, being produced under entirely different conditions. What these variations mean is shown by the following table of tar tests:

	Provan.		Dawsholm.		Dalmarnock.		Tradeston.	
	Woodall-Duckham Continuous Verticals.		Wilson Verticals and Horizontals.		Wilson Verticals.		Horizontals.	
Sp. Gr.	1·035.		1·170.		1·085.		1·175.	
	P.Ct. Yield.	Sp.Gr	P.Ct Yield.	Sp.Gr.	P.Ct. Yield.	Sp.Gr.	P Ct. Yield.	Sp.Gr.
Ammonia water .	2·6	1·018	4·75	1·025	2·65	1·025	3·0	1·003
Crude naphtha . .	1 57	0·864	1 63	0·919	..	..	1·34	0·925
Light oil	10·77	0·962	8·40	0 983	9·54	0·950	6·02	1·007
Middle oil . . .	17·00	0·988	11 60	1·013	17·24	1·000	6·18	1·025
Heavy oil . . .	20·75	1 021	9 70	1·055	22 60	1·050	16·32	1·045
Pitch	45·00	1·120	61 95	1·270	45·18	1·125	68 56	1 280
	97·69		98·00		97·21		98·42	

All tar is distilled by breeze-fired furnaces; no coal being used. This Department has, indeed, become an absolutely non-smoke-producing one, and with the completion of the Dawsholm scheme will become non-dust-producing. The amount of tar delivered to the chemical works from the gas-works over the nine months of the present financial year is shown in the following table, and is compared with the amount delivered during the corresponding period of last year. The effect of American and other foreign coal is indicated by the drop of 1¾ million gallons in the amount of tar received—equal to a decrease of almost three gallons per ton of coal carbonized. It is hardly necessary to point out what a serious matter this has been for this Department, even after making allowance for the lower amount of coal carbonized.

Nine Months ended	February, 1926.	February, 1927.
Coals carbonized (tons).	532,970·65	520,549·3
Tar received (galls.).	7,561,155	5,840,751
Tar per ton of coal carbonized (galls.) . .	14·19	11·22

Tar and Bitumen Mixtures.

Practically one-half of our total sales for road purposes is pure tar; the other half being a compound of tar and bitumen. The tendency seems to be more and more towards the use of mixtures rather than straight refined tar, though there is no gainsaying that the latter is an excellent material for all road purposes. No doubt you are aware that a Committee has been sitting to investigate the specification for Road Board Tar No. 1, or spraying tar; and I have the honour of representing Scottish interests on this Committee. The specification proposed has not yet been made public; but it may be indicated that a higher specific gravity is suggested than is easily attainable by tar from Scottish coal carbonized in continuous verticals. Scotland, however, may be exempt from the proposed specification, as she is exempt from the British Engineering Standard specification for creosote. This difficult point of the specific gravity of refined tars obtained from continuous vertical retort crude tar may be illustrated by considering the tests of a No. 1 tar, or spraying tar, as produced at each of our four works.

—	Provan.	Dawsholm.	Dalmarnock.	Tradeston.
Viscosity .	10 secs.	15 secs.	10 secs.	10 secs.
Sp. Gr. . .	1·135 (Normally 1·120)	1·201 (Normally 1·130)	1·117	1·207

From these figures, it will be seen that, if we assume a specific gravity of 1·160 for the highest-grade spraying tar, then only two of the above tars could meet that specification at present, and Dawsholm Tar would not meet it under normal conditions.

Standardization.

I am in absolute sympathy with any efforts made so to standardize our refined tars that complete satisfaction will be given by them under all conditions of road use. Such standardization is the wisest precaution against competition from imported or artificial rivals for road purposes. Further, refined tars produced under the stringent conditions necessary to comply with such high standard specifications will tend to eliminate inferior tars from other sources, and also tars produced without that attention to detail required to meet such specifications. It is to be regretted as an unfortunate fact that sometimes, even with the best intentions in the world, tars have been sent out for road use which have done the tar industry much harm. The co-operative principle is the best way of meeting competition. Ammonia will in all probability do little for us in the future. Therefore it is our bounden duty to do all we can to safeguard the tar position, and thereby maintain our returns from liquid residuals. It is with this in mind that those responsible for the attempt to introduce a still higher standard for refined tar have acted. I support their aim, though I ask for the exception of Scottish tar produced from continuous vertical crude tar. In this connection let me state that continuous vertical retort tar produced at our Provan Works has been in use on roads under worse climatic conditions than any other roads in Britain, and has stood these severe conditions admirably and without complaint. As a matter of fact, certain alterations in continuous vertical retort carbonization have been mooted which may alter the crude tar produced therefrom. I have every confidence that, if we do our utmost to produce a really reliable material for road use, tar revenue will, in the future as in the past, be important and valuable.

Discussion.

The President, in thanking Mr. Macleod for his paper, said they had had an authoritative statement of the present position of tar and ammonia.

Mr. Robert Sturrock (Ardrossan) agreed that it was not a paying proposition for small works to produce sulphate. In small works they had not the proper apparatus to test tar; and it was difficult to produce a suitable tar for road making. In Ayrshire they usually sent their tar to a central station, though carriage sometimes limited this.

Mr. Robert Gray (Greenock) remarked that in Greenock they were able to make sulphate a paying proposition. Sometimes producers did not give a pure product. With regard to the decreased yield of tar during the coal strike, he thought the increased prices would go a long way to balance this.

Mr. F. L. Maclaren (an early President of the Western District) congratulated the Association on the flourishing report he had heard that afternoon. In the old days of the Association, they often found it hard to make ends meet; and he was glad to know that the Association was not only sound financially, but was taking its place in the conferences of the Junior Associations in the South.

Mr. Macleod replied to the discussion, and was accorded a warm vote of thanks for his paper.

The members were then joined by lady friends; and a happy social evening was spent together.

Mr. Robert Gray presented the retiring President with his Presidential Medal.

Mr. Hall, in reply, thanked all who had assisted and supported him during his term of office.

Mr. Ronald Keillor was presented with the prize for the best paper read last session.

A LABORATORY STUDY OF THE FORMATION AND STRUCTURE OF COKE.

By D. J. W. KREULEN, of the Fuel Research Laboratory, Rotterdam, Holland.

Our contemporary, "Fuel in Science and Practice," publishes in its current issue a lengthy article having the above title. An account is given of laboratory work dealing with (1) the formation of coke during a volatile matter determination, (2) the formation of coke from a piece of coking coal suddenly heated at high temperatures, (3) the formation of coke in the Fischer-Schrader low-temperature test, and (4) the influence of the size of inert matter admixed with coal on the strength of the coke obtained. Laboratory tests were chosen in preference to works practice, because in the former the factors may be varied and the influence of each ascertained.

The cokes obtained were those yielded in the ordinary determination of volatile matter—viz., by heating coal in a platinum crucible. To show the various stages of the coke formation, the crucible, when red-hot, was suddenly cooled by plunging up to the lid in cold water, after heating had been continued for specified lengths of time.

The following results are typical for a number of coking coals.

Formation of Coke during a Volatile Matter Determination.

Time of Heating.	Appearance of Coke.
Secs.	
15	A thin shell or layer of coke is formed which still contains unaltered coal.
20	More layers of coke which form a basin containing unaltered coal.
22	A crater is formed.
23	The ordinary form of coke button is developed. The top is very porous. The button contains unaltered coal.
24	Top less porous; unaltered coal still present.
25	Top still less porous.
30	Top of button closed; unaltered coal still present; colour of button steel-blue.
45	Unaltered coal particles still present.
60	All coal transformed into coke; button dark colour.
90	Colour lighter.
Mins.	
2½	Colour approaching silver-grey.
3	Colour silver-grey.

At 15 secs. a very thin membrane of coke with a brilliant surface is formed at the bottom. Part of the tar substance is raised in a liquid state against the wall of the crucible, and is fixed there during the cooling that follows. On further heating, this liquid mass flows down, and combines with the intermediate scales of coke formed to give the basin at 20 secs. This basin can be readily separated into a number of scales. On further heating, the basin grows in thickness, and a wall forms up the sides of the crucible. Since the liquid mass blows up against the wall, which is at a higher temperature than the bottom, it will be the first to be transformed into a hard coke. The wall continues to grow until the coke crust at the top is formed (at 23 secs.), after which the porous spaces in the coke button become closed; all the coal being transformed into coke and the last traces of tar driven off.

Tests on heating a piece of coking coal suddenly to a high temperature—important in regard to coal-fired furnaces and the domestic grate—show that as soon as a layer of coke of a certain thickness has been formed, the remaining coal loses some of its powers of cohesion, and partly disintegrates. The layer of hard coke on the outside of the coal hinders the escape of the volatile matter, and tar condenses in considerable quantities in the cold fissures of the disintegrating coal within, and so accounts for the different structure of coke formed in the middle of a piece of coal. Such distillation of tar to the inside of the piece of coal was proved by making tests of volatile matter, which showed the inner core of uncoked coal to have 34·4 p.ct. against 31 p.ct. for the original coal. The resistance of the outer shell of coke is also the cause of excessive pressure, which disrupts the mass. These tests lead to the conclusion that the formation of coke from a coking coal is not of necessity a continuous process, but usually takes place layer by layer. When the rate of heating is rapid, the separation of the layers is more or less sharp; but with a very slow rate of heating, coke formation may be continuous. Even in laboratory cokes, with a very slow rate of heating the layered structure disappears and passes into the structure well known in practice.

Anthracite was found to disintegrate during heating; and this is of importance where a coke of high combustibility is desired, because, though the reactivity of coke obtained from anthracite may be less than that of coke obtained from coal, the combustibility of the coke produced from anthracite may still be greater than that made from another coal, owing to the size factor. In the tests carried out with the low-temperature coking apparatus of Fischer-Schrader, it is shown that the degree of swelling is dependent on the rate of heating, as well as on the size of coal. Under the same conditions of heating, the coke obtained from the largest particles is the most porous and fragile. This is explained in the following way. For very fine coal, such of the coal substance as is able to melt spreads, for a certain size of particle, throughout the particle, giving a plastic mass of a certain viscosity which determines the degree of swelling and the dimensions of the pores. With large particles, however, the outsides of the latter melt first, and the lightest tar fractions distil off. The tar continues to come from the inside of the particles, and is consequently mixed with the heavier tar from the outside. The mixture is more viscous than the plastic mass formed in fine coal; and consequently the coking of coal takes place in a more viscous medium, resulting in a more porous and fragile coke.

While the formation of a laboratory coke with a structure similar to that found in practice was successful, subsequent heating of semi-coke to 1100° C. resulted in a very solid coke containing a large number of fissures. It thus appears that, while one coal may give a stronger semi-coke than another, the reverse may be true for the high-temperature cokes obtained from the same coals.

From the results as to the influence of size of inert matter on the strength of coke, the graphs show that the maxima for the different fractions occur at about the same ordinate representing the total surface area of the inert matter present (graded graphite) for 1 gramme of coal. Sand curves show similar phenomena, but, as already recorded by St. Claire Deville, have two maxima. An important conclusion is that, if inert matter be added to a coking coal, the strength of the resultant coke will vary according to the particle size of the inert matter; increase in strength being greater the smaller the size of the particles of inert matter. The maximum increase in strength in all cases is obtained by the addition of approximately the same surface of inert matter per unit of coal.

A remarkable difference is obtained when using different kinds of inert matter, so that it would appear that the so-called inert matter is, in fact, not inert, but exerts specific properties.

The microstructure of laboratory cokes is discussed in relation to Newall and Sinnatt's work on "cenospheres;" and in concluding the author points out that it is important to remember the non-uniform nature of laboratory cokes in all investigations of their properties.

STATIC STORAGE ON DISTRIBUTION SYSTEMS.

The question of static storage used as part of an intermediate pressure system was discussed by Mr. JOSEPH LUCENA, of the Syracuse (N.Y.) Lighting Company, in a paper presented at the annual meeting of the Gas Section of the Empire State Gas and Electric Association.

It was stated by him that Syracuse many years ago adopted an intermediate pressure distribution system, with district regulators; and on account of the central location of the plant, this intermediate system developed somewhat like the spokes of a wheel radiating from a hub. It became apparent a few years ago that a rim should be supplied to the wheel by laying a belt line which would connect-up the ends of the spokes. Such a plan ensures the supply, as it provides dual pressure mains to all sections. In a recent study of this belt line, an examination was made of the possibility of employing static storage at various points around the belt, in order to decrease the initial size of pipe required, further to ensure the supply, and to lessen in some degree the size of future plant holders. As a result, it was found that a belt line designed to supply the city ten years hence would cost approximately the same as a smaller line provided with sixteen 100,000 c.ft. static storage tanks.

ADVANTAGES OF USING STATIC STORAGE.

The following factors likely to influence the adoption of static storage in this way were set forth by Mr. Lucena:

1.—The initial cost of the transmission belt line is reduced.
2.—Any error in the calculation of the required size either way may be compensated for, when necessary, by the addition or omission of a tank.
3.—The system offers extreme flexibility, and permits installations to be made with the minimum investment.
4.—While the cost per 1000 c.ft. of gas stored is higher with static storage than with holders, the insurance of the supply, by having the storage at many points, compensates for this.
5.—By the use of static storage the initial cost of pumping is reduced; for, instead of pumping all the gas to higher pressure at the central station, only that gas stored at the tanks along the line must be raised above the relatively low transmission pressure.

The main principle involved in the proposition to make use of static storage is, it will be seen, to make a relatively small transmission system do the work of a much larger system; and the author said that the Utah Gas and Coke Company, of Salt Lake City, are satisfactorily employing the method. The Syracuse Lighting Company also intend to give it a trial.

NATIONAL ILLUMINATION COMMITTEE OF GREAT BRITAIN.

The following extract is from the report of the Chairman, Lt.-Col. Kenelm Edgcumbe, for 1926, which was presented at the annual meeting of the Committee on Feb. 1:

A change has been occasioned in the personnel of the Committee during the past year through the retirement of Mr. F. W. Goodenough, who has ably represented the Institution of Gas Engineers on the Committee for many years. His place has been taken by Mr. H. E. Copp, Engineer and Manager of the Hull Gas-Works.

It will be remembered that in 1924 the Committee felt that the time had arrived when an increase in standardization work could profitably be undertaken, and that, largely in consequence of representations by this Committee, the British Engineering Standards Association formed a Sectional Committee on Illumination, of which members of this Committee form the nucleus. The work of the British Engineering Standards Association Committee is progressing satisfactorily, and five specifications dealing with important illumination materials or problems have been issued, or are on the point of completion. These specifications are quoted below:

(1) British Standard Specification for Portable Photometers. B.S.S. No. 230—1925.
(2) British Standard Glossary of Terms used in Illumination and Photometry. B.S.S. No. 233—1925.
(3) British Standard Specification for Industrial Reflectors for Direct General Lighting, No. 1 Dispersive (Vitreous Enamel) Type. B.S.S. No. 232—1925.
(4) British Standard Specification for an Illumination Fitting of Translucent Glassware for Interior Lighting.
(5) British Standard Specification for Street Lighting.

Belgium, Germany, and Japan have recently become members of the International Commission, which now includes Belgium, France, Germany, Great Britain, Italy, Japan, Switzerland, and the United States of America.

Mr. P. Good, in a report on the work of the Illumination Section of the "B.E.S.A." during the past year, for the British National Committee of the International Illumination Commission, states that the Sub-Committee on Illumination Glassware has practically completed its first specification for an illumination fitting of translucent glassware for interior lighting. A panel has been appointed to consider the question of neck dimensions of the glassware and galleries; and it is hoped that this panel will be able to arrive at its conclusions within the next few weeks. The Committee is trying to take into account the requirements of those using gas as the illuminant; and the gas interests are assisting on the panel dealing with neck dimensions and galleries. It is hoped that the specification, when completed, will be suitable for adoption by both the gas and the electrical industries.

The International Commission on Illumination will hold a short session at Bellagio from Aug. 31 to Sept. 3. A plenary session of the Commission should take place in New York this year, but for various reasons it has had to be postponed until 1928. The session at Bellagio is solely one for the Executive Committee and the various Sub-Committees appointed by the Commission to study such problems as factory and school lighting, automobile headlights, heterochromatic photometry, definitions and nomenclature, and colorimetry. The meeting will be under the presidency of Dr. E. P. Hyde; and the arrangements are being carried out by the Italian National Committee on Illumination.

REGISTER OF PATENTS.

Gas Meters.—No. 267,596.

ALEXANDER, W., and PINCHBECK, LTD., both of Holloway.

No. 31,783; Dec. 16, 1925. No. 25,404; Oct. 12, 1926.

(Patent of Addition to No. 218,769.)

This invention is an improvement in, or modification of, that claimed in specification No. 218,769 [see "JOURNAL," Vol. 167, p. 590], which described a gas meter in which a pair of diaphragms were employed, arranged back to back and allocated in a casing; each diaphragm forming a separate compartment, and the casing a third compartment, thus forming three separate compartments in all. The diaphragms actuated a pair of valves similar to the valves employed in a meter having four separate compartments, and special mechanism was provided to effect the correct timing of the opening and closing of the inlet and exhaust ports.

According to the present invention, the timing of the valve is effected by so connecting the bellows to the crank that this latter is rotated during each revolution, at a varying speed (for a constant gas flow); the valves being linked directly to the crank or to a second crank fast therewith.

Manufacture of Gas.—No. 267,724.

TRAVERS, M. W., of Highgate, and CLARK, F. W., of Lymm.

No. 9244; April 7, 1926.

(Patent of Addition to No. 198,777 of March 9, 1922.)

This invention is for the introduction of agitating means into the carbonizing chamber of gas-making plant of the type described in specification No. 198,777 [see "JOURNAL," Vol. 163, p. 312] and its added patent No. 210,356 [see "JOURNAL," Vol. 165, p. 569]. The agitator consists of a vertical shaft with vanes or paddles extending into the plastic layer of material.

Manufacture of Products by Oxidizing Coal. No. 268,006.

BONE, W. A., of St. Albans; QUARENDON, R., of Balham, S.W. 12; and the GAS LIGHT AND COKE COMPANY, of Horseferry Road, S.W. 1.

No. 31,520; Dec. 14, 1925.

In the provisional specification the patentees explain that according to this invention coal can be oxidized so as to yield acidic bodies including a considerable proportion of carboxylic acids. While the necessary reaction proceeds in a useful manner when raw coal is used, it can be accelerated considerably in the case of a black coal if the coal be first treated in order to remove or destroy the constituents which in a bituminous caking coal determine its coking and swelling properties. In the case of a brown coal the constituents to be removed or destroyed are those which can be extracted by benzene under pressure.

The simplest method of removing these matters is to treat the coal with an indifferent solvent such as benzene, preferably under pressure at a raised temperature. The residue is a material which is much more reactive than the parent coal.

For example, raw coal or the said residue, in finely subdivided state, may be digested in the cold or at a raised temperature, and under pressure or not, with an alkaline solution of a permanganate. After filtering any matter which is not in solution, there is obtained a solution from which the alkali salts of the carboxylic acids can be crystallized. Of these acids, mellitic acid constitutes a considerable proportion. When operating on the said residue in an autoclave at a temperature rising to 140° to 175° C. with an alkaline solution of potassium permanganate, the yield of crude mixture of acids may amount to 25 to 40 p.ct. of the weight of the coal substance in the residue. Other oxidizing agents yield a similar result.

In the complete specification the patentees enlarge on the statement that mellitic acid is produced by the oxidation of lignite or graphite with $KMnO_4$, and that certain specially prepared forms of carbon when oxidized with permanganate acid in alkaline solution yield an acid closely resembling mellitic acid. They further emphasize the point that any type of coal can be oxidized in this manner—for example, brown coal, lignites, or bituminous coals—but in the case of the last-named, the oxidation is easier if previously the coal has been extracted by a volatile solvent, particularly by benzene under pressure, to remove neutral oils and the substances which cause its coking propensities.

A permanganate is the preferred form of manganate; and the best results have been produced by using alkaline potassium permanganate. In this case the chief constituents of the crude product are potassium salts of benzenoid carboxylic acids, particularly of mellitic acid, which are, of course, readily made to yield the corresponding free acids by treatment with mineral acid. Usually small quantities of salts of other organic acids are simultaneously produced; but by appropriate procedure the proportion of these other salts is relatively small.

In general, the less mature the coal, the more readily is it oxidized by the reagent. Thus, a brown coal is usually more readily oxidized by means of a boiling solution of 10 p.ct. strength of alkaline permanganate than is a bituminous coal. The oxidation of the latter may conveniently be accelerated by treating it with the oxidizing medium in an autoclave under pressure. In such case, however, care should be taken that the temperature does not rise too much, lest a diminished yield of the crude carboxylates be obtained.

While an alkaline solution of potassium permanganate is a very convenient oxidizing medium, the particular strength and alkalinity of the solution most advantageously used, and other conditions, vary with the type of coal. Thus, a solution containing 10 p.ct. of potassium permanganate and 1 p.ct. of potassium hydroxide, at the temperature of its boiling-point under atmospheric pressure, is suitable for the oxidation of a brown coal; but for the oxidation of a bituminous coal (or the residue left by extraction of the coal with benzene under pressure) solutions in an autoclave under pressure are sometimes preferred. In each particular case the requisite amount of permanganate should be ascertained by experiment. This can readily be done by mixing a known small quantity of the coal with an excess of potassium permanganate (say 15 times its weight) and half its own weight of potassium hydroxide, and adding to the mass enough water to produce a solution containing 10 p.ct. of the permanganate. The whole is then heated to boiling in a flask provided with a reflux condenser for about 8 hours. The contents of the flask are then cooled, and the amount of permanganate left in the solution determined in any known manner. The difference between this amount of permanganate and that originally mixed with the coal, gives the proportion of permanganate to coal which should be used in the process.

It is to be understood that sodium permanganate and sodium hydroxide, with due regard to chemical equivalents, may be substituted for the potassium compounds; also that while the use of a raised temperature accelerates the reaction, it is not essential.

Three examples are given to illustrate the process.

Sulphur Compounds of Ammonia from Gas Mixtures.—No. 268,024.

FRIEDRICH SIEMENS A.G., of Berlin, and BAHR, H., of Berlin-Charlottenburg.

No. 32,438; Dec. 23, 1925.

According to this invention sulphur compounds of ammonia in the form of salts are recovered from gas mixtures containing sulphuretted hydrogen and ammonia, by bringing the gas mixture in contact at a sufficiently high temperature with a catalyzer consisting of at least two metals; one being iron, nickel, or copper, which binds the sulphur, and the other, wolfram, vanadium, or chromium, which first takes up the oxygen required for the oxidation of the sulphuretted hydrogen (which oxygen, if necessary, can be mixed with the gas) and then delivers it to the sulphur contained in the metallic sulphide formed, thus forming oxygenated sulphur which, with the ammonia, produces sulphur-containing ammonium salts (sulphites, bisulphites, and/or sulphates).

Regarding coal distillation gases, the patentees remark that these have almost always an admixture of ammonia; and it is important that this should not suffer any decomposition. On the contrary, it combines with the sulphur dioxide or trioxide, formed from the sulphuretted hydrogen, producing acid or neutral ammonium sulphites or sulphates. Upon cooling, these separate off in the form of a mist without condensation of water (when the temperature of the gas remains above the dew-point), and can be easily removed from the gas by the use of high-tension electrodes or by washing them out or filtration. The purification of the gas is thereby effected in a cheap and simple manner; at the same time, the valuable ammonium salts are obtained as a bye-product. The distillation or producer gas to be purified is preferably primarily freed from tar. The heat withdrawn from it for this purpose can, by means of a heat exchanger, be again conducted to other quantities of gas which have already been purified from tar.

The process can also be carried out under increased pressure. It then takes its course at a much lower temperature, whereby the oxidation of easily inflammable admixtures can be avoided with still greater certainty.

Thermostatic Valves.—No. 268,195.

AIRD, K., and MAIN, R. & A., LTD., Falkirk.

No. 16,478; June 30, 1926.

This invention relates to thermostatic valve devices, particularly to those in which means are provided for adjusting the mechanism to respond to a selected temperature. An object of the invention is to provide for the selected temperatures an easily adjustable indicator so that it may be initially set to indicate the temperature which is to be maintained.

Fig. 1 is an elevation, and fig. 2 a sectional elevation, of the device.

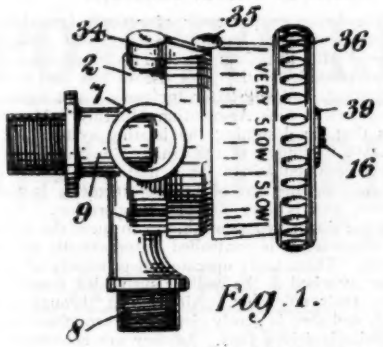
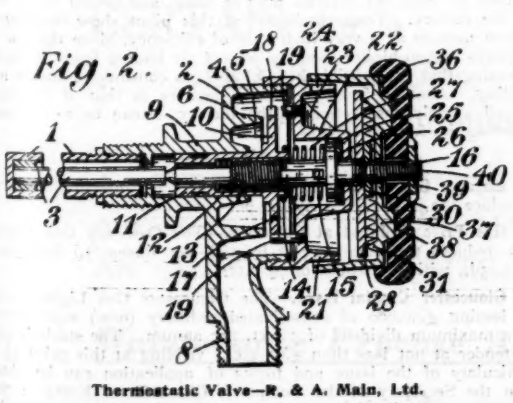


Fig. 1.

Fig. 2.



Thermostatic Valve—R. & A. Main, Ltd.

The thermostat comprises a tube of brass 1 which constitutes the thermally expansible element, which tube is closed at one end and is screwed at the other end into the bottom of a cup-shaped valve-casing 2. A rod 3 of metal having a low coefficient of expansion is secured to the closed end of the brass tube, and projects into the interior of the valve-casing. The interior of the latter has two annular concentric chambers 4 and 5. A partition 6 which separates these forms a flat valve-seat. A conduit 7 which extends outwardly from the casing communicates with the inner chamber and is screw-threaded to receive a gas inlet-pipe; and a second radial conduit 8 communicates with the outer chamber and is externally threaded to receive a gas outlet-pipe. The two conduits are at right angles to one another. A tubular valve-guide 9 is formed centrally in the body of the valve-casing, and extends into it from the base thereof—*i.e.*, from the wall in which the brass tube is secured. 10 is a plate-valve, the stem 11 of which is arranged to be accommodated in the valve-guide.

The stem of this valve is provided with a bore to receive an adjusting tappet 12 provided with a screw-threaded portion 13 which co-operates with a screwthread, also indicated at 13, so that the operative length of the stem may be adjusted. By this means the valve may be adjusted towards and away from its seating. The end of the tappet which is remote from the brass tube is formed with a flat tongue 14 arranged to co-operate with a slot 15 in a rotatable adjusting member 16. A small hole 17 is formed in the flat part of the valve-member in such a position as to be over the inner chamber when the valve-member is assembled. The object of this hole is to afford a by-pass for the pilot light. Slots 18 are provided in the periphery of the plate-valve so as to co-operate with pins 19 screwed into the valve-casing, whereby the valve-member is held against rotation relatively to the valve-seat.

The rotatable adjusting member, which comprises the slotted stem 15, is mounted in a cover 20 which is screwed on to the valve-casing. This cover is provided with a cylindrical flange 21 and with a central boss 22 through which the rotatable adjusting member projects. Two lugs 23 are formed on the cover and boss, spaced apart and directed towards the circumference. A slot 24 is formed in the cylindrical flange opposite the lugs.

A collar 25 formed on the slotted stem of the adjusting member is housed in a recess in the inside of the cover; a leather washer 26 being disposed between the collar and the face of the recess. A helical spring 27 is arranged to surround the stem, and is disposed between the collar and the outer flat face of the valve. The adjusting member extends through the boss, and is provided with a left-hand thread on a part of its length, outside the cover, on which is threaded a disc 28 provided on its outer face with a circular rack. A nut 30 secures the said disc in position on the adjusting member. This rack is arranged to co-operate with a corresponding rack 31 on the inside flat face of a cup-shaped indicating head 32. A flange 33 of the head overlaps and lies close to the cylindrical flange 21 on the cover. The outside cylindrical surface of the head is engraved with a scale having indications of temperature. These words extend over lengths of the scale which are determined by initial calibration.

A pointer 34 and a stop 35 are provided. The adjusting member projects from the outer face of the head and carries on it a disc 36 of heat-insulating material, such as that known under the registered trade-mark "Bakelite." The outside face of the indicating head is provided with projections 37 which co-operate with recesses 38 in the underside of the said disc. The disc, indicating head, and racks are locked together on the rotatable member by means of a slotted nut 39; the end of the rotatable member being provided with a slot 40 whereby it is prevented from rotating when the nut 39 is turned.

All the parts, with the exception of the spring and Bakelite disc, may be conveniently formed of brass.

Coin-Freed Gas Meters.—No. 268,196.

SMITH, E. W., and SMITH METERS, LTD., both of Kennington Park Road, S.E. 11.

No. 16,575; July 1, 1926.

In patent No. 222,787 [see "JOURNAL," Vol. 168, p. 520] was described a variable gear for use with prepayment gas meters in which two toothed wheels of different size can be reversed on their axis so as to alter the quantity of gas delivered for the coin inserted.

The present invention provides an improved means whereby the valve can be externally operated by a removable key for the purpose of closing it independently of the transmission gear. It consists in fractionally mounting part of the transmission gear on a split boss in such a manner that the boss is rotatable by the gear but can also be rotated without turning the gear by means of a removable key which fits to the ratchet-like end of the boss and can rotate it in one direction.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for April 21.]

Nos. 9837—10,366.

BLAKEBOROUGH, R. A.—"Pipe line valves." Nos. 9859, 9862.
DAVIS, H. N.—"Gas-heated radiators." No. 10,304.
I. G. FARBENINDUSTRIE AKT.-GES.—"Preparation for ferric oxide purifiers for gases." No. 9904.
NORRIS, W.—"Adjustment for retort mouthpiece doors." No. 10,141.
PARRISH, P.—"Installations for recovering ammonia from ammoniacal liquor." No. 10,191.
RADIATION, LTD.—See Davis, H. N. No. 10,304.
SALERNI, P. M.—"Distillation of carbonaceous materials." No. 10,064.
SNELLING, F. C.—See Parrish, P. No. 10,191.
SOUTH METROPOLITAN GAS COMPANY.—See Parrish, P. No. 10,191.
TWIGG, W. R.—See Davis, H. N. No. 10,304.
WEIGHT, O. W.—See Parrish, P. No. 10,191.
WOOD, T.—See Blakeborough, R. A. Nos. 9859, 9862.

MISCELLANEOUS NEWS.

GROWING BUSINESS IN THE ALDERSHOT COMPANY'S AREA.

Electricity Generation by Gas Engines.

There was a pleasant little ceremony on Monday, April 25, when, at the invitation of the Chairman and Directors of the Aldershot Gas, Water, and District Lighting Company, a large gathering assembled to witness the laying of a foundation stone in connection with an extension of the Company's electricity generating station at North Camp and Farnborough Works.

After some introductory remarks by Mr. R. W. Edwards (the Chairman and Managing Director of the Company), in the course of which he emphasized the growth of the undertaking and the great importance of the service which it renders to the community, the ceremony of laying the stone was performed by Councillor T. Cochrane (the Chairman of the District Joint Industrial Council, No. 11, for the Electricity Supply Industry).

The 3000 volt alternating current is generated by means of Browett-Lindley vertical engines run on town gas; and the two 225 KW. sets now being installed will practically double the capacity of the station. The work is being carried out under the supervision, as Consulting Engineer, of Mr. W. A. Tookey, M.Inst.Mech.E.

The function completed, motor coaches conveyed the guests to the Ash Road Works of the Company, where tea was served.

The Fruits of a Progressive Policy.

The activities of the Company have been manifold from its inception, as it was realized that the surrounding districts to be served would feel the wants of modern convenience and comforts applicable to lighting, heating, &c. The Company's position is somewhat unique, inasmuch as it is the only one of its kind to which parliament has granted powers to supply the three important commodities—gas, water, and electricity.

For a period of over thirty years the Company has been extending its public service in fulfilment of the desire to be useful; and it is now nearly twenty years since statutory powers were obtained to supply electricity—the Company being at the same time re-incorporated under its present title. The output of electricity is advancing rapidly; and the further outlook in regard to the generating station is such that, with the advent of an Extension of Area Order (now emerging, and which will cover additional districts, making the total area of supply over 135 square miles), together with existing contracts, it is anticipated that the output for 1931 will be 3 million units, and for 1933 5 millions. The policy of generation and distribution of electricity has been on broad lines; the object in view from the commencement having been to link-up the various primary departments. This has so far been achieved; but further developments are now to be met as the business extends.

Considering the Future.

These problems were realized by the Directors some time ago, and tentative schemes have been prepared, in collaboration with eminent consulting experts, for a large generating station; but unfortunately these have had to be put on one side pending the further growth of the Company's own output, and the genesis of a wider scope for bulk supplies beyond its present districts. The Company is preparing, however, to deal with the situation as these circumstances evolve in conjunction with its own position.

Another point of interest which has been considered by the engineering department is the question as to the best site. The Company has two large works—viz., the one at North Camp (South Farnborough), which occupies an area of 30 acres, in the county of Hampshire, and is scheduled for the manufacture and storage of gas, conversion of residuals, manufacture of apparatus, and generation of electricity. This site has a peculiar claim to consideration, inasmuch as the main line of railway between Dover and the North runs through these works, offering, with the River Blackwater, which forms the boundary of the works, excellent facilities, and fulfilling the primary requirements in respect to the installation of a large electricity generating station.

The other site, at Ash Road, Aldershot (North and South Works), occupies an area of 46 acres, of which 40 acres constitute the South Works. The site here in mind is again adjacent to the River Blackwater, but has not the same advantageous position, because of its immaturity. Otherwise there are distinct advantages on account of the railway facilities possessed by the Company; and the site is adjacent to the large gas manufacturing station of the Company. The manufacture of bye-products—such as coke, breeze, and tar—at these works is an important factor, as all these would be available for steam raising on a large and economical scale.

These resources will be of considerable value, and the question for decision is the most central position; the works at North Camp, which is the Company's present pivot for electricity supply, having a little advantage, being geographically in a favourable position for feeding-into or linking-up with other districts—such as Ascot, Woking, Guildford, Reading, Basingstoke, Winchester, and that of the new Wessex Company. The main transmission lines, which it is understood are to run south from London to Portsmouth, and west to Southampton, have also been considered; and the situation of the North Camp Works has a distinct claim towards materially assisting the district facilities for electrical generation and supply in this respect, as it lies almost midway between the two lines.

Finally, the possibilities of greater demands for electricity are materially influenced by the Company's own works developments, in so much that the day-load factor is already very appreciably contributed to by demands for power, &c., at the other works of the Company, whereby the cheaper production of electricity and gas are interwoven.

The gas manufacturing plant at Ash Road is being designed to meet an estimated coal throughput of 700 tons per diem, which would yield 350 to 400 tons of coke and breeze every twenty-four hours. Whether a super-generating station is erected at Ash Road or North Camp, this large quantity of economical coke fuel would be available.

GAS REGULATION ACT APPLICATIONS.

SPECIAL ORDERS.

Harrogate Gas Company.

To empower the Company to purchase the undertakings of the Boston Spa Gas Company, the Tadcaster and Wetherby District Gas Light Company, Ltd., and the Boroughbridge Gas Light Company, Ltd., and the gas undertaking of the Knaresborough Urban District Council; to raise further capital; and to make other provisions with reference to the business.

St. Ives (Hunts.) Gas Company.

To empower the Company to use scheduled land for gas purposes; to increase the borrowing powers, and make other financial provisions; to authorize the Company to contract with any local authority, company, or person, whether within or beyond the limits of supply, for the supply of gas to each other; and for other purposes.

Lighting and Eyesight.

At a meeting of the Michigan Section of the Illuminating Engineering Society of the United States, Mr. G. A. Henry (Director-General of the Eyesight Conservation Council of America) said there are to be found poor eyes and poor light in schools, homes, and industry. Possibly one-third of the retardation in public schools is due to the neglected eyesight of children. School children unable to progress rapidly in their studies because of defective vision cost the country $130,000,000 a year; accidents resulting from poor lighting annually amount to $300,000,000; and $30,000,000 of industrial waste every year is charged directly to poor lighting. In addition to these calculated losses, there is no basis for calculating the cost to industry due to defective vision; and if a figure were available, its proportions would be so astonishing that one probably would not believe it. Of the 42,000,000 persons working in the United States, more than 25,000,000 are handicapped by defective vision or eye strain. Good lighting, of comparative cheapness, is available; and scientific detection and correction for the defective eye will relieve the human race of much needless suffering. There is urgent need for the education of the public concerning eye care, involving both the correction of sight and a knowledge of proper lighting.

Factories without Chimneys.

Cincinnati is the fortunate possessor of several factories without chimneys; the latest of these having been recently constructed by the Huber Builders' Material Company. This elimination of chimneys was rendered possible by the joint use of gas and electricity—the former for heating, and the latter for power and light. In an article in the "American Gas Association Monthly," Mr. Alvin M. Forkner explains that, in designing the heating system, Mr. Huber consulted Mr. E. W. Esslinger, of the Union Gas and Electric Company, who made recommendations for a unit heating system. The principal feature of this method of heating factories is that it requires no attention, and is very flexible in operation. It may be turned on full or cut down to the minimum to meet the temperature requirements. Otherwise it is controlled automatically by means of thermostatic valves. These units operate independently of each other and may be either attached to the wall or suspended from the ceiling without lessening their efficiency. Air is sent through the units, where it is heated, and then is gently circulated throughout the factory by means of electrically-driven fans. As they are constructed on the re-circulation principle, air from inside the building may be passed through the heaters over and over again, where conditions permit, or fresh air from the exterior may be taken and heated before entering the factory. Tests conducted at this plant show that the unit heaters operate at a very high rate of efficiency, since the flue temperatures are no higher than the heated air issuing from the heaters, indicating that the sensible heat of the gas consumed remains in the building. Another feature of these heaters is that if the heat is wanted in only one section of the factory, it can be so directed by adjusting the fan.

Cheaper Gas at Thorne.—The Thorne Gas Company have decided to reduce the price of gas by 6d. per 1000 c.ft.

Gas Price Reduced at Oswestry.—The Oswestry Gas Company have reduced the price of gas by 10d. per 1000 c.ft., from 6s. 3d. to 5s. 5d., with a discount of 7½ p.ct.

Gloucester Capital Issue.—The Gloucester Gas Light Company are issuing £30,000 of consolidated ordinary (new) stock, ranking for a maximum dividend of 5 p.ct. per annum. The stock is offered for tender at not less than £95 p.ct., yielding at this price 5¼ p.ct. Particulars of the issue and forms of application can be obtained from the Secretary of the Company, Gas Offices, Eastgate Street, Gloucester. Applications must be received by or before 12 o'clock noon on Wednesday, May 4. Maximum dividends have been paid by the Company since 1856. The capital is required to increase the plant, which is now heavily taxed by the growing demands for gas, and for laying new mains.

COAL TRADE REPORTS.

From Our Own Correspondents.

NORTH-EAST COAST.

There is no improvement in any section of the market, and the outlook is exceedingly depressing. Northumberland steams are down to 14s. 6d. to 14s. 9d. f.o.b. for best screened sorts, and even at these prices, which are little above the pre-war level, there is no demand from the Continent. It appears to be largely a question of competition, especially by German coals, as there is a fair volume of inquiry, which results in very little business. Gas coals generally are maintaining their quotations; but the position is not any too strong, especially for the poorer qualities. Coking coals are weak, and the demand for them is very slack.

Altogether the situation is very black in both counties, and the volume of trade is not nearly enough for the potential output. Unfortunately, the resultant short working has the effect of putting costs up, and so making it still more difficult to compete for export trade. Buyers still seem unwilling to contract ahead, though no one here can see where there is any possibility of further reducing costs.

Wear Special gas makes maintain their quotation at 17s. 6d., and best qualities are 17s. to 17s. 6d. f.o.b. Seconds are called 15s. to 15s. 6d., and coking unscreened is nominally the same. Best bunkers are 15s. 9d. to 16s. 6d.

Gas coke is in fair demand, and the output is just about being cleared; quotations for shipment being 22s. to 23s. 6d. f.o.b.

YORKSHIRE AND LANCASHIRE.

Gas coals in Yorkshire and Lancashire move easily against contract, with no stabilized figures for forward business. The position varies at each supplying source, even those within the same area of production. Some collieries have full order books, while others are working short time.

The export market in respect of the East Coast still shows no sign of anything like normal trade, although exporters are inclined to think that the next few months may see some alteration.

With the reduction of prices for household coal generally, business in this section of the trade is likely to flow normally in the future.

The industrial situation does not improve, which indicates a lack of confidence in the general trade of the country. The "key" consuming industries are working very spasmodically, and in some instances there is no immediate prospect of improvement.

The following are the Humber bunker and export prices, f.o.b. usual shipping ports: South Yorkshire—Hards, Association, 20s. 3d. to 20s. 6d.; screened gas coal, 19s. 6d. to 20s.; washed trebles, 19s. 3d. to 20s. 3d.; washed doubles, 18s. 6d. to 19s.; washed singles, 18s. to 18s. 6d.; washed smalls, 16s. 6d.; unwashed doubles, 17s. 6d.; rough slack, 13s. 6d.; smithy peas, 19s. 6d. to 21s. 6d. per ton. West Yorkshire—Hartleys (f.o.b. Goole), 18s. to 19s.; screened gas coal, 19s. to 20s.; washed trebles, 18s. to 19s.; washed doubles, 18s. to 18s. 6d.; washed singles, 17s. 6d. to 18s.; washed smalls, 16s. to 16s. 6d.; unwashed trebles, 17s. 6d. to 18s.; unwashed doubles, 16s. to 17s.; rough slack, 13s. to 13s. 6d.; coking smalls, 14s. per ton. Derbyshire and Nottinghamshire—Top hards, 22s. 6d. to 23s.; washed trebles, 19s. 6d. to 20s.; washed doubles, 18s. 6d. to 19s.; washed singles, 18s. to 18s. 3d.; unwashed doubles, 18s. to 18s. 6d.; rough slack, 14s. 6d. per ton. Yorkshire, Derbyshire, and Nottinghamshire—screened steam coal, 17s. 6d. to 20s.; gas coke, 25s. to 29s.; furnace coke, 26s. to 27s. per ton.

MIDLANDS.

A half-hearted start was made in the coalfields after the Easter holidays. Few collieries are able to dispose of more coal than can be raised in about half the working week. The policy of buying from hand to mouth is not likely to be departed from before the autumn. Most of the coal raised for home consumption is on rail, nobody having the boldness to stock in existing circumstances.

Any re-invigoration of demand would be immediately felt at the pits. In some provinces of industry—the South Staffordshire trade is an example—the depression tends to deepen; and while the outlook is brighter in some of the lighter metallurgical branches and in the glass houses, inquiry for steams and other works fuel shows no measurable improvement. In the nature of things no expansion of the house coal trade can be looked for yet awhile. The immediate prospects in mining districts of the Midlands are therefore grey.

It is anticipated that with the approach of next winter there will be a rush for domestic supplies which will strain the productive and distributive organization beyond endurance. But consumers have been so deeply imbued with the notion that prices must continue to fall that they are heedless of the danger of defeating their object by neglecting to avail themselves of the dead season's facilities. Average grades of house coal are making 27s. to 30s. at the pithead. There is no change in industrials save for the automatic hardening of slacks and smalls.

Reduction in Price at Walton-on-Thames.—The Directors of the Walton-on-Thames and Weybridge Gas Company announce that, as from the Lady-day reading of the meters, the price of gas will be reduced by 3½d. per therm. This reduction will make the price 1s. 1d. per therm, which is the same as was charged before the coal stoppage.

Buxton Gas Exhibition.—Arrangements have been made for a gas exhibition to be held in the Demonstration Room at the Gas Service Buildings, Buxton, from Monday, May 9, to Saturday, May 21. Mr. F. G. Shaw (the Gas Manager) has secured the services of Miss H. H. Tuxford, who will give lectures and practical demonstrations with gas cookers; and these will take place each afternoon and evening.

POSITIVE RECORD

GAS CALORIMETER

(Simmance's Patent)

ACCURATE

No Water Troubles.

CERTAIN for a LONG RUN without attention.

A PERFECT TEST INSTRUMENT.
A PERFECT RECORDING MACHINE.
AN AUTOMATIC TESTER.

Maintenance Expense Avoided.

ALEXANDER WRIGHT & CO., Ltd., Westminster, S.W.1

Telephone: VICTORIA 1207. Telegrams: PRECISION, SOWEST, LONDON.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *April* 25.

Business in pitch for the current season is now practically at an end, and the price is nominal at about 75s. to 80s. per ton f.o.b. makers' works. There is a certain amount of inquiry for next season's shipment; but it is difficult to say at the moment at what level the price will settle. Very large quantities of tar are being taken for road work, and it is not anticipated that it will be necessary to make much pitch during the summer months.

Creosote is firm at 8¾d. to 9d. per gallon.

Tar spirits are a little easier: pure toluole being about 2s. to 2s. 1d. per gallon, pure benzole about 1s. 10d. to 1s. 11d. per gallon, and solvent naphtha 1s. 6d. to 1s. 7d. per gallon for 95/160 quality.

Phenol remains firm at not below 9d. per lb. in large drums and overcasks.

Tar Products in the Provinces.

April 25.

The average values of gas-works products during the week were: Gas-works tar, 57s. 6d. to 62s. 6d. Pitch—East Coast, 75s. to 80s. f.o.b. West Coast—Manchester, 72s. 6d. to 79s. 6d.; Liverpool, 75s. to 80s.; Clyde, 77s. 6d. to 80s. Benzole, 90 p.ct. North, 1s. 5d. to 1s. 6d.; crude, 65 p.ct. at 120° C., 1s. 0¼d. to 1s. 0¾d., naked at makers' works; 50-90 p.ct. naked, North, 1s. 6d. to 1s. 7d. Toluole, naked, North, 1s. 6¼d. to 1s. 7¼d., nominal. Coal-tar crude naphtha, in bulk, North, 7¼d. to 8d. Solvent naphtha, naked, North, 1s. 2¼d. to 1s. 3¼d. Heavy naphtha, North, 1s. to 1s. 1d. Creosote, in bulk, North, liquid, 7¼d. to 7¾d.; salty, 7¼d. to 7¼d.; Scotland, 7¼d. to 7¾d. Heavy oils, in bulk, North, 9d. to 9¼d. Carbolic acid, 60 p.ct., 2s. 6d. prompt. Naphthalene, £11 to £14: salts, 100s. to 110s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

CONTRACTS OPEN.

Steel Roof.

Tenders are invited by the City of Salford for the supply and erection of a steel roof. [See advert. on p. 250.]

Coal.

The Leek Gas Department are inviting tenders for the supply of washed gas nuts. [See advert. on p. 250.]

The Gas Department of the Thornton Urban District Council are inviting tenders for the supply of gas and steam coal. [See advert. on p. 250.]

Resetting Retorts, &c.

Tenders are invited by the Milford Haven Urban District Council for the resetting of a bed of retorts and the relining of a furnace. [See advert. on p. 250.]

The Gas Committee of the Winsford Urban District Council are inviting tenders for the dismantling and replacing of a bench of retorts, &c. [See advert. on p. 250.]

Liability for Defective Gas Fittings.

A point bearing on liability for defective gas fittings was discussed in Belfast, at the adjourned inquest on Mary M'Allen, of Josephine Street, who died from gas poisoning. Several other members of the household were overcome, but recovered in hospital. The inquiry had been adjourned to allow the landlady to give an explanation of the condition of one of the lower rooms, which had been described as "unfit for habitation." The landlady (Mrs. English) and her agent (Mr. J. H. Donaldson) gave evidence which showed that they were unaware of the condition of affairs. It was also stated that they had nothing to do with the gas fittings; the meter being of the penny-in-the-slot type, and put in by the Corporation. An official of the Gas Department said that in these houses a gas meter was installed after an application had been made. A gas bracket was fixed in the kitchen; but if the tenants wished to have one upstairs, they had to put it in themselves. Further evidence was given that the bracket in the bedroom had been put in by a sub-tenant, who left about three years ago. In returning a verdict that death was due to a defective gas fitting, the Coroner said that someone ought to be made responsible for these fittings before and during the period of occupation. Tragedies of this nature were too common, and something should be done to prevent further fatalities. He thought the agent should employ a qualified man to inspect the fittings. Mr. Donaldson suggested that the Gas Department should shoulder the responsibility; but the Coroner said the Corporation had no authority to inspect private property, and it should be the duty of the house agent.

Reduction in Price at Stafford.—The Stafford Town Council have decided to reduce the price of gas by 4d. per 1000 c.ft.

Bombay Gas Company, Ltd.—At to-day's meeting of shareholders, the Directors will report a profit on revenue account for the year ended Dec. 31 of £21,700. Adding the profit on exchange £5122, interest £360, and the balance of £40,576 brought forward from the previous year, there is a total of £67,759. After providing for the interim dividend paid in November last and the addition of £1647 to the reserve fund, £1099 to the renewal fund, and £207 to the insurance fund, there remains a balance of £52,804, out of which the Directors recommend the payment of a dividend of 4 p.ct. (less income-tax), making 8 p.ct. for the year, which will leave £40,804 to be carried forward.

South Suburban and South Metropolitan Agreement Approved.

It is announced that the agreement with the South Metropolitan Gas Company, under the terms of which the South Suburban Gas Company will obtain a bulk supply of gas, &c., has received the official approval of the Board of Trade. At an early date stockholders will be invited to exchange their holding for 6 p.ct. preference stock of the South Metropolitan Gas Company. The terms of the agreement were fully explained at an extraordinary meeting of the South Suburban Company which was reported in the "Journal" for March 2 last.

Reduced Price at Kidderminster.—The Kidderminster Gas Company have reduced the price of gas by 6d. per 1000 c.ft., as from the March readings of the meters.

Haywards Heath District Gas Company.—Moving the adoption of the report and balance-sheet at the annual meeting of the Company, Mr. E. C. Charleton, Chairman of Directors, said that the gas sold during the year showed an increase of 9·5 p.ct. The result of the year's working was a profit of £4199. From this they had paid a dividend on the 6½ p.ct. redeemable stock and on the debentures. The Directors proposed to pay a final dividend at the rate of 7½ p.ct. for the half-year ended Dec. 31, making a total dividend of 7½ p.ct., less income-tax, for the year. This would leave a balance of £3966 to be carried forward. Mr. Joseph Cash seconded the motion, which was carried.

Welwyn and Hatfield Preference Share Issue.—By order of the Directors, Messrs. A. & W. Richards are offering for sale by tender 2000 £5 6½ p.ct. preference shares in the Welwyn and Hatfield Gas Company, Ltd. The minimum price at which the shares will be issued is par; and tenders are to be sent to the firm at 37, Walbrook, London, E.C. 4, not later than Tuesday morning, May 3. The capital is required to pay the balance of the cost of a new gasholder, new mains, meters, and stoves, and other works in order to provide for the rapidly increasing demand for gas. The sales of gas last year were 67½ million c.ft., which was an increase of 18 p.ct. over those of the previous year.

Inflammability of Coal Dust.—Coal dust is inflammable, but its inflammability can be reduced by intermixture with incombustible dust. Various coal dusts, however, have different degrees of inflammability, and the quantity of incombustible dust that requires to be added to a particular coal dust in order to render the mixture incapable of propagating flame consequently varies. The inflammability of coal dust is dependent upon a number of factors; and several laboratory methods have been proposed for determining the relative inflammabilities of different coal dusts with sufficient accuracy to render extensive large-scale tests unnecessary. A paper by A. L. Godbert entitled "Laboratory Methods of Determining the Inflammability of Coal Dusts" (Safety in Mines Research Board Paper No. 31; H.M. Stationery Office, Adastral House, Kingsway, W.C. 2; price 1s. 6d. net) which has just been published contains a historical survey of the subject, a review of the influence of various factors on the inflammability of dust clouds, and a discussion of the relative inflammabilities of coal dusts. It indicates the lines of further researches now proceeding in the Board's laboratories at Sheffield, and should be regarded as preliminary to a full report on the results of those researches.

City of Santos Improvements Company, Ltd.—Mr. N. B. Dickson, M.Inst.C.E. (the Chairman), presiding at the annual meeting of the Company, dealt with the operations of the various undertakings during the past year. He said that the consumption of gas for domestic purposes showed the satisfactory increase of 37 p.ct.; and the total sales had exceeded those of the previous year by 14·8 p.ct. Domestic consumption had more than doubled in volume in less than three years; and there was still a large field for expansion in this department, as cooking by gas was becoming more popular every year. The total return from residuals had been rather more than maintained; the demand for coke having been good. The continued expansion of the gas business would require the installation of increased manufacturing and storage plant in the immediate future, as there seemed every prospect that the growing demand would be maintained. He expressed the Board's high appreciation of the services rendered by the Manager (Mr. Bernard F. Browne) and the Sub-Manager (Mr. R. N. Davies). In spite of a very trying climate, they had risen to the occasion and overcome the many difficulties inseparable from the strenuous expansion of the Company's undertakings, in which task they had been ably supported by the staff.

Following the advice of a Ministry of Health Inspector, the Falmouth Board of Guardians, whose institution is still lighted by paraffin lamps, have decided to take into consideration the adoption of a safer and more comfortable system of illumination.

On the night of April 18 an explosion of gas occurred at 240, Dudley Road, Birmingham, doing extensive damage, and causing slight injury to several persons. One of these, a man named Prince, entered the front room on the ground floor, to ascertain the cause of a smell of gas. He lit a match, in order to apply it to one of the burners of a three-light chandelier, and immediately there was a violent explosion.

The offices of the Enniskillen Gas Company were recently entered by some person or persons unknown, and ransacked. The desks were broken open, and papers strewn about. An attempt was made to force the large safe in the Manager's office; but this was unsuccessful. A smaller safe in the offices was not interfered with: the burglars apparently overlooking it. As to how the offices were entered, is more or less a mystery, as the windows and doors were intact, and the locks and latches were all in order.

MAIN

Bring Down Building Costs
by using
NOVOCRETE FLUE BLOCKS
and
MAIN GAS-FIRE MANTELS

NOVOCRETE Flue Blocks can be built into the wall thickness and so eliminate projecting chimney breasts, and all the extra materials required for foundations, footings, trimmers, arches, hearths, and stacks. They are only half the weight of other concrete-mixture blocks and consequently save carriage. They possess greater compressive and tensile strength and so reduce the risk of breakage in transit and handling. Nails can be driven or screwed into Novocrete without fracture to the material. It is also fire-resisting and will not disintegrate by the action of products of combustion.

Main Gas-Fire Mantels embrace a series of 16 different designs, with fires of 5 and 7 radiants. They are supplied as complete suites (comprising the fires, mantels, shelves, hearths, and curbs), and cost considerably less than fires of equal efficiency with the other items as separate units.

Further information regarding Novocrete Flue Blocks and Main Gas-Fire Mantels can be obtained on application to : :

R. & A. MAIN, Ltd., LONDON AND FALKIRK

London Office and Showrooms, 38, Grosvenor Gardens, S.W. 1
Glasgow Office and Showrooms, 82, Gordon Street

GLOVER-WEST
VERTICAL RETORTS

Ease of Management

No elaborate machinery to break down

Scientific management is rewarded by maximum results

West's Gas Improvement Co. Ltd.

Miles Platting
MANCHESTER

Telephones—
CENTRAL 5961 (3 lines)

Telegraphic Address:—
"STOKER, MANCHESTER"

LONDON
Regent House, Kingsway, W.C.2
Telegraphic Address:—"IMVERTRET, WESTCENT, LONDON"
Telephone:—**REGENT 0387**

SYDNEY
Union House, 243, George Street, Sydney, N.S.W.
Telegraphic Address:—"VERTICAL, SYDNEY"

NEW YORK (U.S.A.)
WEST GAS IMPROVEMENT Co. OF AMERICA
Incorporated
441, Lexington Avenue, New York
Telegraphic Address:—"VERTICALS, NEW YORK"
Telephone—**MURRAY HILL 7242**

PARIS
CIE. GLE. DE CONSTRUCTION DE FOURS
8, Place des Etats-Unis, MONTROUGE (Seine)
Telegraphic Address:—"CORMIQUES-MONTROUGE (Seine)"
Telephone:—**SEGUR 92-63 & 92-64**

STOCK MARKET REPORT.

ALTHOUGH the holiday atmosphere continued on the Stock Exchange last week, there was an immediate improvement in business. The unexpected reduction in the Bank Rate on Thursday imparted strength to investment securities, and stimulated the general activity. In responsible quarters it is now regarded that the situation in China is well in hand, and the financial situation is clear. The reduction in the Bank Rate makes the Colonial Government securities very attractive, and ensures the success of the Australian loan. Among new issues the London County Council scrip rose to par. In the Foreign Market French Rentes improved on the virtual stabilization of the franc. There was a general liveliness in the Industrial Market; Textiles, Tobaccos, and Breweries being most prominent. Home Rails were not neglected, and considerable interest was taken in the new issue of the London Midland and Scottish Railway of £5,750,000 5 p.ct. debenture stock at £97, redeemable in 1952.

The values of Gas Stocks continued to improve; and it will be seen by the Table that seven ordinary stocks were marked up. The Commercial two stocks are again higher; the quotations being 84-87 for the 4 p.ct. stock and 83-86 for the 3½ p.ct. stock. These prices compare with 77-80 and 74-77 in November last. Hastings two stocks were both marked up 2 points. These stocks are attractive investments, but are difficult to obtain. An item of interest to holders of South Metropolitan and South Suburban stocks is the announcement that the agreement by which the latter Company will obtain a bulk supply of gas, &c., has received the approval of the Board of Trade.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr	Dividends. Last Hf. Yr.	NAME.	Quotations. Apl. 22.	Rise or Fall on Week.	Transactions. Lowest and Highest Prices.
£			%p.a.	% p.a.				
171,978	Stk.	Feb. 10	5	5	Aldershot 5 p.c. max. C. .	70—73	..	..
823,992	,,	,,	4	4	Do. 4 p.c. Pref. . .	66—71	..	..
1,551,868	,,	Apl. 7	6½	7	Alliance & Dublin Ord. .	83—86*	..	84½—85
274,000	,,	Jan. 18	4	4	Do. 4 p.c. Deb. . .	65—68	..	..
2,900,000	1	Oct. 14	1/7½	1/7½	Bombay, Ltd.	1—1½	..	..
170,000	10	Mar. 10	8½	8½	Bournemouth 5 p.c. . . .	12½—13½	..	12⅝—12⅝
600,050	10	,,	7	7	Do. B 7 p.c. . .	11½—12½	..	12
275,000	10	,,	6	6	Do. Pref. 6 p.c. .	10½—11½	..	..
50,000	Stk.	Jan. 13	3	3	Do. 3 p.c. Deb. .	53—56	..	..
163,025	,,	,,	4	4	Do. 4 p.c. Deb. .	73—76	..	..
357,900	,,	—	—	—	Brighton & Hove 6 p.c. Con.	100—105	..	104—105
341,800	,,	—	—	—	Do. 5 p.c. Con.	90—95	..	..
1,387,500	,,	Feb. 24	5	5	Bristol 5 p.c. max. . . .	88—89a	..	..
855,000	,,	Mar. 24	8	7	British Ord.	105—108	..	107—107½
100,000	,,	Dec. 30	7	7	Do. 7 p.c. Pref. . .	112—117	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	75—80	..	..
100,000	10	Dec. 9	6	6	Cape Town, Ltd. . . .	7—8	..	..
100,000	10	Oct. 28	4½	4½	Do. 4½ p.c. Pref. .	6—7	..	..
150,000	Stk.	Dec. 30	4½	4½	Do. 4½ p.c. Deb. .	68—73	..	..
826,860	,,	Feb. 24	6	6	Cardiff Con. Ord. . . .	99—102	..	..
287,860	,,	Dec. 30	7½	7½	Do. 7½ p.c. Red. Deb. .	100—103	..	..
157,150	,,	Feb. 24	5	6½	Chester 5 p.c. Ord. . . .	86½—91½b	..	..
79,185	1	Sept. 30	†2/-	1/4½	Colombo Ltd. Ord. . . .	27/—29/-	..	..
24,498	1	,,	1/4½	1/4½	Do. 7 p.c. Pref. .	20/—22/-	..	..
221,490	1	Apl. 7	1/9½	1/9½	Colonial Gas Assn. Ld. Ord.	24/6—26/6*	..	..
173,900	1	,,	1/7½	1/7½	Do. 8 p.c. Pref.	20/—22/-*	..	..
1,513,280	Stk.	Feb. 24	5½	5½	Commercial 4 p.c. Cap. .	84—87	+1	85½—86½
660,000	,,	,,	5/3/4	5/3/4	Do. 3½ p.c. Cap. .	83—86	+1	84½—84½
475,000	,,	Dec. 30	3	3	Do 3 p.c. Deb. . .	54—57	..	..
800,000	,,	Sept. 30	§2	§1	Continental Union, Ltd. .	28—33	..	..
200,000	,,	Mar. 10	7	7	Do. 7 p.c. Pref. .	79—82	..	..
787,560	,,	Mar. 10	6½	6½	Croydon sliding scale . .	95—99	..	..
408,100	,,	,,	5	5	Do. max. div.	77—80	..	79—79½
492,270	,,	Feb. 24	9	9	Derby Con.	104—106c	..	..
65,000	,,	Dec. 30	4	4	Do. Deb.	73—75c	..	..
209,000	,,	Mar. 10	5	5	East Hull Ord. 5 p.c. . .	76—80	..	..
50,000	,,	Dec. 30	5	5	Eastbourne 5 p.c. Deb. .	92—97	..	..
1,002,180	10	Mar. 24	†3	†3	European, Ltd.	5½—6½	..	6⅛—6⅛
18,747,460	Stk.	Feb. 10	5/1/4	5	Gas Light & Coke 4 p.c. Ord.	87—89	+½	87⅛—88
2,800,000	,,	,,	3½	3½	Do. 3½ p.c. max. . . .	59—61	+½	60—60⅜
4,157,020	,,	,,	4	4	Do. 4 p.c. Con. Pref. .	75—78	..	78⅛—78⅜
5,602,680	,,	Dec. 30	3	3	Do. 3 p.c. Con. Deb. .	58—60	—½	58½
181,315	,,	,,	—	6	Do. 6 p.c. Br'if'd Rd. Db.	100—105	..	103½
1,642,770	,,	,,	—	5	Do. 5 p.c. Red. Deb. .	99—101	..	..
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb. .	..	..	..
82,600	,,	Mar. 10	6½	6½	Hastings & St L. 5 p.c. Conv	90—92	+2	91—92
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	67—72	+2	..
70,000	10	Oct. 14	†10	†10	Hongkong & China, Ltd. .	12—13	..	..
173,200	Stk.	Mar. 10	5	5	Hornsey Con. 3½ p.c. . .	67—69	..	..
1,976,000	,,	Nov. 11	†10	10	Imperial Continental Gas.	139—143	+1	140—142
233,130	,,	Feb. 10	3½	3½	Do. 3½ p.c. Red. Deb.	69—71	..	..
235,242	,,	Mar. 10	6½	6½	Lea Bridge 5 p.c. Ord. . .	92—97	..	94½
4,145,907	,,	Feb. 24	5½	5½	Liverpool 5 p.c. Ord. . .	81—82b	+½	..
600,000	,,	Sept. 30	7	7	Do. 7 p.c. Red. Pref.	101—103b	..	..
165,736	,,	Feb. 24	9	8	Maidstone 5 p.c. Cap. . .	110—115	..	..
69,480	,,	Dec. 30	3	3	Do. 3 p.c. Deb. . .	52—57	..	..
75,000	,,	Dec. 9	†7	†7	Malta & Mediterranean .	5½—5¾	..	..
541,920	Stk.	Nov. 25	†6	†5	Montevideo, Ltd.	80—83	..	..
4,061,815	,,	Feb. 24	5	5	Newcastle & Gateshead Con.	73½—74½d	..	..
360,929	,,	,,	4	4	Do. 4 p.c. Pref. .	68½—69½d	..	..
691,705	,,	Dec. 30	3½	3½	Do. 3½ p.c. Deb. .	63—66d	..	..
131,765	,,	—	—	—	North Middlesex 6 p.c. Con.	93—95	..	..
800,000	,,	Nov. 25	7	9	Oriental, Ltd.	97—102	..	..
188,120	,,	Dec. 30	7½	7½	Plym'th & Stonehouse 5 p.c.	105—110	..	..
414,500	,,	Feb. 24	7½	7½	Portsm'th Con. Stk. 4 p.c. Std.	100—105	..	..
236,732	,,	,,	5	5	Do. 5 p.c. max.	76—79	..	..
4,289,909	1	—	—	—	Primitiva Ord.	14/3—15/3	..	14/3—15/-
392,200	100	Dec. 1	4	4	Do. 4 p.c. Red. Deb. . .	85—87	..	..
600,000	Stk.	Jan. 27	4	4	Do. 4 p.c. Red. Deb. 1911	70—72	..	..
484,968	,,	Dec. 30	—	4	Do. 4 p.c. Cons. Deb. . .	70—72	..	..
150,000	10	Mar. 24	6	6	San Paulo 6 p.c. Pref. . .	73—73	..	..
125,000	50	July 1	5	5	Do. 5 p.c. Red. Deb.	47—50	..	..
270,000	Stk.	Mar. 24	5½	6½	Sheffield A	95—97a*	..	..
419,986	,,	,,	5½	5½	Do. B	95—97a*	..	..
1,047,000	,,	,,	5½	6½	Do. C	95—97a*	..	..
90,000	10	June 11	4	—	South African	4—6	..	..
6,609,855	Stk.	Feb. 24	5	7	South Met. Ord.	99—101	+½	99½—100½
1,995,445	,,	Jan. 13	3	3	Do. 3 p.c. Deb. . .	57—60	..	..
734,000	,,	Mar. 10	6½	6½	Do. 6½ p.c. Red. Db.	99—101	..	..
91,500	,,	Feb. 24	8½	8½	South Shields Con. . . .	105—107d	..	..
1,343,795	,,	Mar. 10	6½	6½	South Suburban Ord. 5 p.c.	101—104	..	103½—103½
368,837	,,	Dec. 30	5	5	Do. 5 p.c. Deb.	93—96	..	96
647,740	,,	Mar. 24	5	5	South'mpton Ord. 5 p.c. max.	74—77	..	..
121,275	,,	Dec. 30	4	4	Do. 4 p.c. Deb.	68—73	..	..
350,000	,,	Feb. 24	7	7	Swansea 7 p.c. Red. Pref. .	100—102	..	..
300,000	,,	Dec. 30	6½	6½	Do. 6½ p.c. Red. Deb.	102—104	..	..
150,000	,,	Feb. 24	7½	7½	Tottenham District A 5 p.c.	105—110	..	..
889,275	,,	,,	6½	6½	Do. B 3½ p.c.	89—92	..	90½—91½
150,000	,,	,,	5½	5½	Do. 5½ p.c. Pref.	97—100	..	..
181,265	,,	Dec. 9	4	4	Do. 4 p.c. Deb.	72—75	..	..
368,261	,,	Mar. 10	5	5	Tynemouth Con. and New Uxbridge, Maidenhead, & Wycombe 5 p.c. . . .	69—71d	..	..
197,394	,,	Mar. 10	6½	6½	Do. 5 p.c. pref. . .	85—90	..	..
98,880	,,	,,	5	5	Do. 5 p.c. Maidenh'd	83—88	..	..
91,800	,,	,,	6½	6½	Wandsworth, Wimbledon, and Epsom—	83—88	..	..
30,000	,,	Mar. 10	8½	8½	Wandsworth A 5 p.c. .	120—125	..	..
256,626	,,	,,	7	7	Do. B 3½ p.c. .	102—107	..	..
132,532	,,	,,	5/19/0	5/19/0	Do. C and New	90—95	..	..
350,000	,,	,,	6½	6½	Wimbledon 5 p.c. . . .	98—103	..	..
90,000	,,	,,	7½	7½	Epsom 5 p.c.	103—108	..	..
88,416	,,	Dec. 30	3	3	3 p.c. Deb.	54—57	..	..

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. * Ex. div. † Paid free of income-tax. ‡ Plus 8½ p.ct. p.a. special dividend. § For year.

The following transactions were recorded during the week:

On Tuesday, European 6 5/12, Gas Light and Coke 87⅛, 87⅜, 3½ p.ct. 60, 60½, 4 p.ct. preference 76⅝, Primitiva 14s. 3d., South Metropolitan 99½, 99⅝, 100. Supplementary prices, Barnet 5 p.ct. debenture 97, Southgate 7½ p.ct. debenture 102½.

On Wednesday, Alliance and Dublin 85, Brighton and Hove 6 p.ct. 105, British 107, 107½, Commercial 4 p.ct. 85⅜, 86½, 3½ p.ct. 84¼, 84⅜, European 6½, Gas Light and Coke 87⅛, 87⅜, 87⅞, 88, 3½ p.ct. maximum 60, 3 p.ct. debenture 58⅛, 6 p.ct. Brentford debenture 103¾, Imperial Continental 140, Lea Bridge 5 p.ct. 94½, Primitiva 14s. 6d., 14s. 7½d., Tuscan 22s. 6d. Supplementary prices, Eastbourne 3½ p.ct. "B" 103½.

On Thursday, Bournemouth original 12⅝, "B" 12, Brighton and Hove 6 p.ct. 104, British 107⅞, Croydon maximum dividend 79, 79⅜, European 6½, 6⅛, Gas Light and Coke 87⅞, 87⅞, 4 p.ct. preference 76½, Imperial Continental 140, 141, Primitiva 14s. 6d., 14s. 7½d., 14s. 9d., 14s. 9¼d., 15s., South Metropolitan 99⅜, 99¾, 100, 100⅛, South Suburban 5 p.ct. 103½, 5 p.ct. debenture 96, Tottenham "B" 90⅜, 91⅛. Supplementary prices, Hornsey 5 p.ct. preference 84.

On Friday, Alliance and Dublin 84⅛, 85, Commercial 4 p.ct. 85⅛, Gas Light and Coke 87⅛, 87⅜, 87⅞, 87⅞, 3½ p.ct. maximum 60⅜, Hastings and St. Leonards 5 p.ct. converted 91, 92, Imperial Continental 142, Lea Bridge 5 p.ct. 94½, Primitiva 14s. 10½d., 15s., South Metropolitan 99⅞, 99¾, 100⅛, South Suburban 5 p.ct. 102½, 103, Tottenham 3½ p.ct. 90⅜. Supplementary prices, Barnet 5 p.ct. debenture 97, Bournemouth 7 p.ct. debenture 103⅜, British 5 p.ct. debenture 97, Croydon 6 p.ct. debenture 99⅛.

Money was plentiful in Lombard Street. Old day-to-day loans were continued at 3½ p.ct., but new accommodation was easily obtainable towards the close at from 3½ p.ct. to 3 p.ct. Discount rates were again easier. This was due to the low rate at which Treasury Bills were allotted. The average rate—£3 12s. 11·86d. p.ct.—was exceptionally low, even after taking the ½ p.ct. reduction in the Bank Rate into consideration.

On the Foreign Exchange Market, Sterling on New York declined to 4.85 13/16. Italian lire were strong, and closed at 92¼. French francs were again steady at 124; Belgas were lower at 34.93½; and other exchanges were also inclined to droop.

Silver was firmer on Eastern support, and the price rose to 26½d. per oz. Gold advanced ½d. to 84s. 11½d. per oz.

The Bank Rate is 4½ p.ct., to which it was reduced from 5 p.ct. on April 21, 1927. Bankers' deposit rates are 2½ p.ct. The deposit rates of the discount houses are 2½ p.ct. at call and 2¾ p.ct. at notice.

GASHOLDER AND TANK CONSTRUCTION AT THE SUTTON GAS-WORKS.

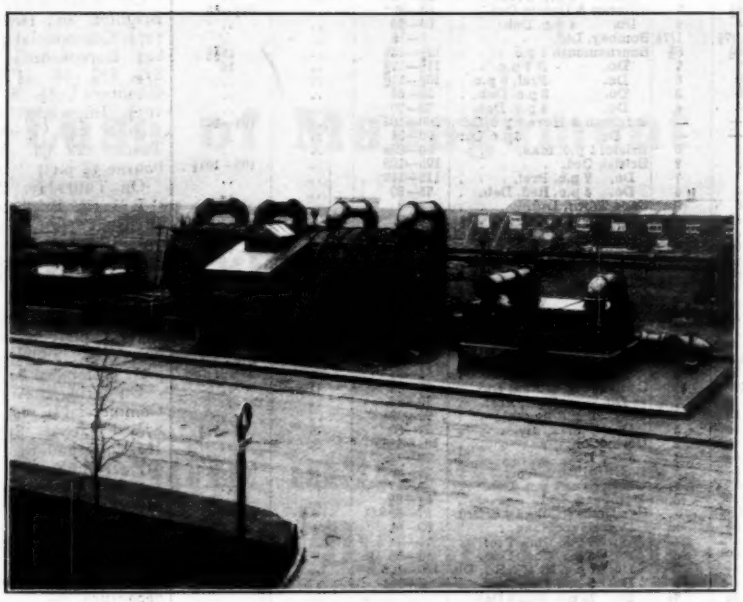
1,000,000 cubic feet capacity

By F. SOUTHWELL CRIPPS.

Price 10/6 net.

WALTER KING, LTD., "GAS JOURNAL" OFFICE, No. 11, Bolt Court, FLEET STREET, E.C. 4.

"HOLMES' Super Type Installations for 1927"



A recent **HOLMES'** Installation at the new Pitwines Works of the Bournemouth Gas and Water Company.

The above Plant, working in conjunction with an installation of **HOLMES' "SUPER" TYPE CONDENSERS,** recovers the whole of the tar and ammonia contained in the gas without washing with water.

The ROTARY WASHER (1920 PATENT BRUSH WASHER) is used for concentration of weak liquor, the ammonia remaining in the gas being absorbed by sulphuric acid in a final **HOLMES' CONTACT CHAMBER.**

A HOLMES' PATENT "DRI-GAS" PLANT will also shortly be in operation, enabling all gas produced on the works to be freed from moisture and naphthalene before distribution.

W. C. HOLMES & Co., Ltd.

GAS - AND - BYE-PRODUCTS - ENGINEERS

TELEPHONES:
H'FIELD 1573
PVTE. BRANCH EX.

Whitestone Ironworks,
HUDDERSFIELD

TELEGRAMS
"HOLMES
HUDDERSFIELD"

CONTENTS.

EDITORIAL NOTES.

The Gas Charge "Mystery" 283
Hygroscopicity of Sulphate of Ammonia . . 283
The Johannesburg Contract 284
The Aldershot Combination 284
Trade Disputes Bill Manœuvres 285
Unwanted "All-Electric" Houses—Acknowledgment of Good Services 285
Institute of Fuel—Wareham Electricity Promotion—Road Fund Appropriation . . . 286

Personal 286
Obituary—Dr. Geoffrey Weyman 286
Electricity Supply Memoranda 287
Forthcoming Engagements 288
The Institute of Fuel—Amalgamation of the Institution of Fuel Technology and the Institution of Fuel Economy Engineers . . 289
Presentation to Mr. J. H. Sillitoe 289
National Gas Council—South-Western District Executive Board Meeting 290
Some Observations on the Hygroscopicity of Bye-Product Sulphate of Ammonia, and the Effect thereon of the Presence of Traces of Pyridine Sulphate. By J. Macleod, F.I.C., M.I.Chem.E., C. Chapman, F.I.C., A.M.I.Chem.E., and T. A. Wilson, F.I.C., A.R.T.C. 291
The Mechanism of Coking 294
Progress of Photometry—Visit of the Illuminating Engineering Society to the National Physical Laboratory 295

"Keith" Patent Thermostat Gas Controller 296
Relative Value of Mild Steel and High Tensile Steel in Reinforced Concrete—Outline of a Controversy 296
Jubilee of the North of England Gas Managers' Association 297
Vertical Retort House at Darlington—A Glover-West Installation 299
The Powers of Charge of the Metropolitan Gas Companies 300
Yorkshire Junior Gas Association—Coal Tar Distillation. By B. Thorpe . . 301
Western Junior Gas Association—Presidential Address of Mr. C. Bateman . 304
Manufacture of Sulphuric Acid and Sulphate of Ammonia from Calcium Sulphate . . 306
Coal and Bye-Products Exports and Coal and Oil Imports 307
Primary Decomposition of Coal 308

CORRESPONDENCE.

Glasgow Corporation Chemical Works Department 308
"Developments in Wales" 308

PARLIAMENTARY INTELLIGENCE.

House of Lords—
Progress of Bills 308
Special Order 308
House of Commons—
Progress of Bills 308

REGISTER OF PATENTS.

Applications for Patents 308

MISCELLANEOUS NEWS.

London and Aldershot Electricity Charges . 309
Bombay Gas Company—Ordinary General Meeting 309
A Celebration Dinner 310
Institution of Gas Engineers' Examinations—Gas Engineering and Gas Supply . . . 311
Coal Trade Reports—
North-East Coast 313
Yorkshire and Lancashire 313
Midlands 313
Current Sales of Gas Products 314
Trade Notes 314
Contracts Open 314
Stock Market Report 315

PARAGRAPHS.

Jubilee of the Evening Star Lodge—North of England Gas Managers' Association—Cooling and Cleaning Plant at the Scunthorpe Gas-Works 288
Forthcoming German Exhibition 295
High-Pressure Gas Research 296
Long-Distance Gas Distribution 306
Verticals *v.* Horizontals—Gas Research at Michigan University—Pulverized Carbonized Fuel 307
A Fine Family Record—Gas Prices at Halifax—Oriental Gas Company's Dividend—South African Lighting Association Dividend—Successful Stock Issue at Lewes—Cheaper Gas at South Shields—Waterless Gasholder Company, Ltd.—Manufacture of Gas Appliances in Australia—Low Price of Plymouth Gas 314

"JOURNAL" OFFICE TELEPHONE.

The "Journal" Office Telephone Number is "Central 6055."

For List of "JOURNAL" Advertisers, *see* p. 319.

GENERAL

"Raised Level"

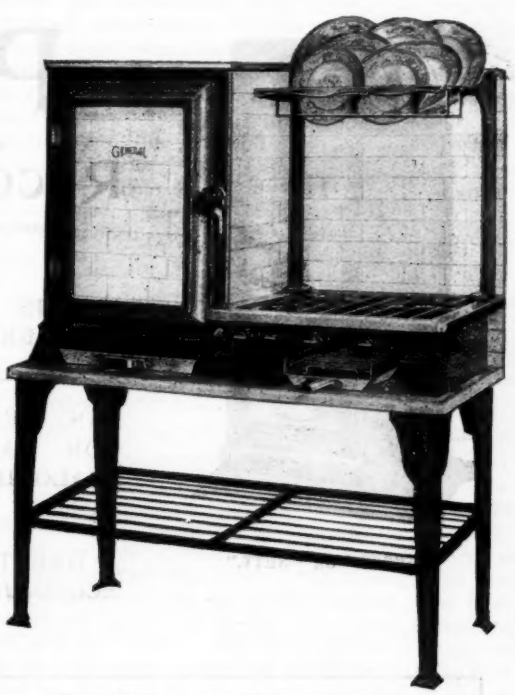
AND

"Dainty"

COOKERS

ATTRACTIVE
COMPACT
COMPLETE

Combining features which make for EASE AND SIMPLICITY IN COOKING.



GENERAL GAS APPLIANCES LIMITED

Guide Bridge, Manchester.

If Quality counts

YOUR ORDER IS FOR

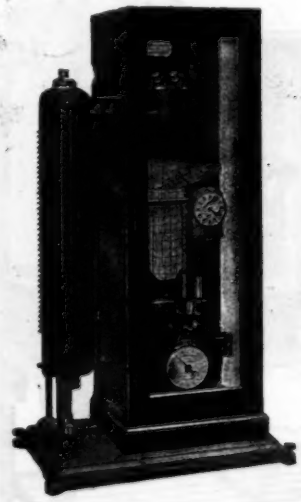
Thomas Glover

THOMAS GLOVER & CO. LTD.

GOTHIC WORKS, ANGEL RD. EDMONTON, N.18

ORIGINAL DRY METER MAKERS
ESTABLISHED IN 1844

Branches at BELFAST, BIRMINGHAM, BRISTOL, EDINBURGH, GLASGOW, MANCHESTER & NEWCASTLE-ON-TYNE



"GROSS" OR "NETT."

PARKINSON'S

IMPROVED

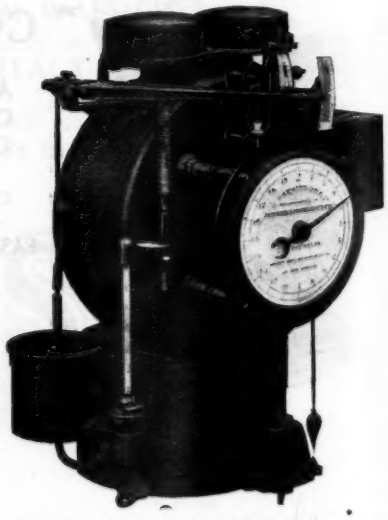
RECORDING CALORIMETER

(Beesley's Patents)

CHARTS NEED NO CORRECTION.

CAN BE SUPPLIED FOR GAS OF ANY CALORIFIC VALUE.

A GREAT BOON FOR *ECONOMIC WORKING.*



PATENT CONTROLLER, DEALING WITH
Density
Temperature
Barometric Pressure
(Can be supplied separately).

W. PARKINSON & CO.,

INCORPORATED IN PARKINSON & COWAN (GAS METERS), LTD.

COTTAGE LANE, CITY ROAD, LONDON, E.C. 1.
Telegrams: "INDEX, ISLING, LONDON."
'Phone Nos.: 4270 Clerkenwell

BELL BARN ROAD, BIRMINGHAM.
"GASMETERS, B'HAM."
2345 Midland, B'ham.

MORNINGTON STREET, ORMEAU ROAD, BELFAST.
"PREPAYMENT, BELFAST."
3374 Belfast.